

Holme Fen NNR Management Plan



**This plan covers the period:
*April 2015 – March 2020***

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1.1 Location

		Notes
Location	Holme Fen lies approximately 4 kilometres south of Yaxley and 1kilometre to the east of Holme, Cambridgeshire. The main east coast railway line forms the western boundary	
County	Cambridgeshire	
District	Huntingdon	
Local Planning Authority	Huntingdonshire District Council	
National Grid Reference	TL 205890 (centre of site)	OS Sheet 1:50,000: 142



1.2 Land Tenure

	Area (ha)	Notes
Total Area of NNR	266	658 acres
Freehold		<p>There are no constraints over the majority of the reserve over which Natural England holds the freehold. Constraints which do operate over parts of the reserve are as follows:</p> <p>a) A conveyance dated 17 February 1981 relating to the purchase of 4.08 acres on the southern edge of compartments (cpts) 42 and 46 (see conveyance for full details):</p> <p>b) A conveyance dated 11 February 1988 relating to the purchase of 0.56 acres on the eastern edge of cpt 24 (see conveyance for full details):</p> <p>See site files for full details.</p>
Leasehold		<p>Part leased from British Rail :</p> <p>An agreement dated 25 November 1983 with British Railway relating to the non-business letting of cts 50 and 51.</p> <p>An Agreement (Site Management Statement) dated December 2003 with Network Rail regarding mitigation of the effect on the NNR of any works to the railway.</p>
Legal rights of access		<p>NNR dedicated Open Access under CROW Act on 19th June 2014. Prior to this public access was permitted along marked paths.</p> <p>The site is reached from the west via the Yaxley-Holme road (Hod Fen Drove) or from the southeast from the B660) Ladyseat Road / New Long Drove).</p>
Other rights, covenants, etc		None
Notes		Much of the land to the north-east and south of the NNR is now owned by the Great Fen partners, of which Natural England is one.

1.3 Site Status

Legal designations affecting the site

Designation	Area (ha)	Date	Notes
NNR	266	Declaration(s): May 1952	
SSSI	266	Notification (1981 Act): 1985	
GCR		1/50:142	Part of site (TL207886) notified for its Holocene sea level change interest
Other designations (site):			
Wider designations:			Part of Great Fen project area (undesignated).

1.4 Physical Features

The physical aspects of the reserve which form part of the site's importance or which have a bearing on its management

Geology

The reserve lies on an average of 3m depth of freshwater peat. Beneath this is Oxford clay, which in some areas may be covered by boulder clay.

Geomorphology

The reserve lies at the western edge of the fen basin. To the west are gentle hills of Oxford clay, much of which are covered by boulder clay. To the east is the bed of the former Whittlesey Mere, which is largely calcareous marl, some of it over peat, some over clay. No streams of any size flow into the basin.

Elevation of the site is about 2.5 metre below OD. The site now stands slightly higher than the surrounding farmland which continues to waste away at the rate of about 2cm per annum.

Soils

Soils are peat, approximately 3m deep, lying over clay. There has been little removal or cultivation of the peat so much of the upper layers are intact, although very dry and oxidised to some extent..

Hydrology & Hydrochemistry

The NNR is severely impacted by the occurrence of four Internal Drainage Board (IDB) arterial drains which pass through the site, which have caused major de-watering of the peat body. Two drains (Short Drove and New Long Drove) were diverted in 2003 and the drainage water routed around the eastern edge of the reserve.

Due to seepage and the low level of agricultural drains to the east, the reserve is still effectively drained. The only ditches to hold water regularly are in the northern section around Stilton's Roughs (Forestry Dyke). There are two meres (Burham/McPhail's and Boston's) which were excavated in the 1980s.

During 2013-14 the Great Fen partnership carried out works in the area to the north-east of Holme Fen in an area known as Rymes reedbed. The effect of these works will be to raise water levels which will in turn impact on water levels within cts. 1-10 and to a lesser extent cts.15-24. Reversion of arable land to the south (Summer Standing) has allowed the installation of new water controls in the Short Drove dyke which has raised the water table in cts. 21,22,28-30

Climate

As far as temperature is concerned Holme Fen has a continental climate with a mean annual temperature of about 8°C. Average sunshine is typical of much of southern England. Precipitation is very low as Holme Fen is within the driest area of the country.

Average precipitation for the period 1963-92 was 545mm (the driest place in Britain is St.Osyth in Essex = 513mm).

1.5 Biological Features

The plants, animals and habitats which form part of the reserve's importance and which contribute to national and local biodiversity

Holme Fen is considered to be Grade 1 national importance in "A Nature Conservation Review (Ratcliffe 1977).

Flora

A total of 331 plant species (plus a few sub-species) have been recorded from the NNR, but 16 of these were recorded only between 1900 and 1949. A further 49 extinct species were associated with Whittlesey Mere prior to and for a time after its drainage. Nationally notable species include:

Flowering Plants

<i>Luzula pallidula</i>	Fen Woodrush RDB
<i>Rumex palustris</i>	Marsh dock
<i>Sagina ciliate</i>	Annual pearlwort
<i>Viola canina ssp montana</i>	Heath dog violet

Other species of more local interest include climbing corydalis *Corydalis claviculata*, royal fern *Osmunda regalis* and narrow buckler fern *Dryopteris carthusiana*. Twayblades *Listera ovata* and common and heath-spotted orchid *Dactylorhiza spp.* are found occasionally in small numbers. Some relicts of the raised bog include bog myrtle *Myrica gale*, saw sedge *Cladium mariscus* and a few *Sphagnum* species, although the number of Sphagna has declined markedly in the last 50 years and even more since the drainage of the mere..

Fungi

Fungi are a major feature of the NNR.

<i>Collybia murina</i>
<i>Collybia succinea</i>
<i>Cortinarium bibulous</i>
<i>Fomes fomentarius</i>
<i>Hebeloma pusillum</i>
<i>Hypholoma marginatum</i>
<i>Lactarius umbrinus</i>
<i>Lepiota georginea</i>
<i>L. melanotricha</i>
<i>Leucoagaricus crystallifer</i>
<i>Mycena pearsoniana</i>
<i>Naucoria langei</i>
<i>Volvariella surrecta</i>

Fauna

Odonata		
<i>Brachytron pratense</i>	Hairy dragonfly	ISR(Nb)
<i>Coenagrion pulchellum</i>	Variable blue damselfly	ISR (Nb)
<i>Libellula fulva</i>	Scarce chaser	RDB 2
<i>Sympetrum sanguineum</i>	Ruddy darter	ISR (Nb)
Beetles (Coleoptera)		
<i>Acalles ptinoides</i>		ISR(Nb)
<i>Agabus undulates</i>		RDB 3
<i>A. unguicularis</i>		ISR (Nb)
<i>Agathidium marginatum</i>		ISR (Nb)
<i>Anisotoma humeralis</i>		ISR(Nb)
<i>Aphthona nigriceps</i>		ISR(Na)
<i>Atheta excelsa</i>		ISR (Nb)
<i>Badister unipustulatus</i>		ISR (Nb)
<i>Biblopectus tenebrosus</i>		pRDB
<i>Cassida nebulosa</i>		RDB 1
<i>Cercyon convexiusculus</i>		ISR (Nb)
<i>Cryptocephalus parvulus</i>		ISR(Nb)
<i>Cryptorhynchus lapathi</i>		ISR(Nb)
<i>Curculio rubidus</i>		ISR(Nb)
<i>Dendroxena quadrimaculata</i>		ISR(Nb)
<i>Diaperis boleti</i>		RDB 2
<i>Emus hirtus</i>		RDB 1
<i>Enicmus brevicornis</i>		ISR(Nb)
<i>Enochrus ochropterus</i>		ISR(Nb)
<i>Graptodytes granularis</i>		ISR(Nb)
<i>Gyrophana munsteria</i>		ISR(Na)
<i>Habrocerus capillaricornis</i>		ISR(Nb)
<i>Hydaticus seminiger</i>		ISR(Nb)
<i>Hydraena testacea</i>		ISR(Nb)
<i>Hydrochus carinatus</i>		RDB 2
<i>H. transversalis</i>		RDB 3
<i>Hydroglyphus pusillus</i>		ISR(Nb)
<i>Ischnomera cyanea</i>		ISR(Nb)
<i>Laccobius sinuatus</i>		ISR(Nb)
<i>Limnebius nitidus</i>		ISR(Nb)
<i>Longitarsus curtus</i>		ISR(Na)
<i>Lythraia salicariae</i>		ISR(Nb)
<i>Magdalis cerasi</i>		ISR(Nb)
<i>Melasis buprestoides</i>		ISR(Nb)
<i>M. piceus</i>		ISR(Nb)
<i>Notaris scirpi</i>		ISR(Nb)
<i>Omalium allardi</i>		ISR(Nb)
<i>Orchestes testaceous</i>		BAP, RDB 2
<i>Panagaeus crux-major</i> ?Extinct		RDB 1
<i>Phytobius comari</i>		ISR(Nb)
<i>Platydracus fulvipes</i>		ISR(Nb)

<i>Plegaderus dissectus</i>		ISR(Nb)
<i>Rhynchaenus pratensis</i>		ISR(Nb)
<i>Rhynchites longiceps</i>		ISR(Nb)
<i>Scoparia ulmella</i>		ISR(Na)
<i>Sterropterix fusca</i>		ISR(Nb)
Lepidoptera		
<i>Ladoga Camilla</i>	White Admiral butterfly	
<i>Perizoma saggitata</i>	Marsh carpet	RDB
<i>Synanthedon culiciformis</i>	Large red-belted clearwing	ISR(Nb)
<i>S. vespiformis</i>	Yellow-legged clearwing	ISR(Nb)
<i>Xestia rhomboidea</i>	Square-spotted clay	ISR(Nb)
<i>Xylena exsoleta</i>	Sword-grass	ISR(Nb)
True flies (Diptera)		
<i>Dichetophora finlandica</i>		pRDB 3
<i>Ditomyia fasciata</i>		ISR(Nb)
<i>Exechiopsis dumitrescae</i>		ISR(Nb)
<i>Hilara lugubris</i>		ISR(Nb)
<i>Homoneura interstincta</i>		RDB 3
<i>Lasiemba brevibucca</i>		ISR(Nb)
<i>Lonchaea hirticeps</i>		ISR(Nb)
<i>Meonura triangularis</i>		ISR(Nb)
<i>M. strigata</i>		ISR(Nb)
<i>Pherbellia brunnipes</i>		ISR(Nb)
<i>Platycheirus immarginatus</i>		ISR(Nb)
<i>Sceptonia tenuis ?</i>		RDB 1
Grasshoppers/crickets (Orthoptera)		
<i>Metrioptera brachyptera</i>		ISR(Nb)
<i>Tettigonia viridissima</i>		Local
Leafhoppers(Hemiptera)		
<i>Edwardsiana alnicola</i>		ISR (Nb)

Habitats and communities

In addition to species of national or local importance, the following plant communities characterise the majority of the reserve habitats. These are described by their National Vegetation Classification (NVC) headings: Molinia heath/mire, swamp, open water, and woodland.

Molinia heath / mire (M25) is found in more acid areas in the north around Burnham's Mere (ct. 3) and in the central area ct. 18.

There is one area of relict bog in ct.5 which is more akin to W2 woodland Sphagnum community within the woodland.

Swamp vegetation (S4) with reed as the main dominant occurs in small patches around the meres and scattered in some areas within the woodland.

Open water is present in the meres and in a few restricted dykes which still hold water all year.

Bird communities are also well represented. Despite the major vegetation changes due partly to maturing woodland structure but also muntjac browsing, there remain viable populations of breeding warblers including 2-3 nightingales, garden, sedge and reed warbler, common whitethroat etc. A heronry has been present for many years, although it moves continually through the site. Waterfowl communities include up to 19 breeding pairs of cormorant. Woodcock breed regularly.

Invertebrate communities are also important, particularly Odonata and Lepidoptera.

1.6 Cultural Features

Landscape importance, historical and archaeological features of the NNR and its use for purposes other than nature conservation

Joint Character Area:

Landscape Character

No. 46 The East Anglian Fens

The reserve is situated at the extreme western edge of the East Anglian fenland basin. At the south-west corner of the site, the clay is very close to the surface and within a few hundred metres of the western boundary, the land rises up and the peat is absent. This is JCA no. 88 Bedfordshire and Cambridgeshire Claylands

Archaeological and Historical Features

The most important feature is the Holme Post. The original was erected in 1852 and was probably sourced from the Great Exhibition of 1851. It is fixed to timber piles which were driven through the peat to the underlying clay This is a globally unique feature illustrating the effects of peatland drainage and is regularly visited The second post was installed in the 1950's and stands on a concrete pile.

There are few other known features, although there have been considerable finds of archaeological interest from Whittlesey Mere, adjacent to the NNR. Recent boreholes adjacent to the NNR have exposed the old mire surface which is still in existence, although now covered by woodland. Just outside the NNR to the north-east of ct.24 is the site of a Spitfire fighter plane which crashed during the 2nd world war. This is due to be excavated in autumn 2015. Some finds have been made in the bed of the former Whittlesey Mere including limestone blocks from Barnack and a log boat.

Land-Use History

Prior to 1851, the site of the NNR was on the banks of Whittlesey Mere. When the mere was drained in 1851, the land around was gradually drained and converted to arable

farmland, but much of Holme Fen seems to have escaped this, with only a very limited amount of peat digging.

The origin and date of the woodland cover is poorly documented. Such information as has been traced that is specific to the Reserve is as follows:

The north-east boundary of the Reserve in 1851 where it bounded Whittlesey mere would have been reed and sedge. South-west of this fringe was open wet peat bog, flooded in winter, which would have dried out sufficiently in summer for grazing and litter cutting to be possible. An 1821 map of the Lordship of Yaxley, which included the north boundary of the present Reserve, refers to Horses Fen, Cow Fen and Hog Fen. Although nearly a quarter of this Lordship was referred to as undrained fenland, clearly it was used in some way. Stilton Roughs (cts. 1 and 2) was part of Stilton parish, and on an 1805 parish map was referred to as Turf Fen, so clearly peat cutting was practiced here long before the drainage of Whittlesey Mere.

The Fielden Estate papers refer frequently to Holme Fen, particularly the area along Short Drove. There is a memorial document of 1808 referring to 'fen feeding in Short Drove in Holme Fen', and there are other references to grazing on various documents up to the 1870s. In a conveyance of 1872 an area of land lying south of Caldecote Dyke - and probably including ct. 4 - is described as 'rough fen'.

On the 1890 O.S. 1" map, all the land within the Reserve was shown as farmland with no trees, although there were some in the coverts. A Mr H.A. Leeds who visited the area in 1894 said that he recalled the areas as all arable with no trees, but Fenton dates the planting of Ballards and Holme Lode coverts as '1870 or perhaps a little earlier'. He also refers to islands of conifers and hardwoods along with birch.

During the 20th century, woodland gradually increased as the water table dropped. In 1932, the Land Utilisation Survey described the woodlands of Holme Fen as a pheasant cover, composed mainly of Silver Birch. In 1940, 400 acres were requisitioned to supply charcoal and the remains of one of the kilns can still be seen today in ct.19 (see Bibliography - Sheail). During the 2nd world war, extensive areas in the northern part of the site were felled to make charcoal, and the remains of the kiln can still be seen in ct.18.

The history of peat shrinkage as recorded at the Holme Fen posts has been well documented (see Bibliography - Hutchinson).

The peat stratigraphy is well documented, as is the management of the site since the end of the second world war. The profile and acidity of the peat has been further studied during the last management period by Duncan (see Bibliography).

The original Holme Fen post is popularly thought to have been taken from the Great Exhibition building of 1851. Hutchinson (1978) disputes this, however, and maintains that the post came from a barn on nearby Park Farm. The probability is that while the post did not come from the structure of the Exhibition (hence was not shown on the drawings which Hutchinson examined) it could have come instead from one of the interior fittings which were auctioned off when the event closed. The more modern post is a lamp-post which was erected in the 1950s in case the original post fell down or became unstable. Both posts were renovated in 1992 and a new cap added to the original post.

Socio-economic Use

Before NNR designation, there was a period of use as game cover, and parts of the site were clear felled for charcoal production during the 2nd World war.

Very little use economic use has been made of the reserve since its designation as a nature reserve. Although the peat derived from the excavation of the meres was sold commercially, the profit was taken by the government and was not retained for reserve use.

Until 1992, public use was limited by a permit system, a few hundred of which were issued each year. Open access has increased visitor numbers to approximately 12-15000 (not specifically counted) of whom many are dog-walkers. Whilst many visitors are not particularly interested in the wildlife, they are greatly appreciative of the quiet and scenic nature of the NNR which is unique in this area. There is also regular use by small numbers of runners and walking groups.

With the building of Trundle Mere Lookout hide at the north-east corner of the site in 2013, there has been greatly increased use of the NNR to access the hide and there was considerable activity along the road in the winter of 2013-14 where birdwatchers were parking to get good views of rare birds.

A cache situated by the Posts is an added feature which attracts some visitors.

In 2014 Holme Fen was designated as Open Access under the CROW Act.

Education

Occasion university groups visit the reserve, but its use by school-children is at present very limited

Research Use

Research is encouraged, both into the scientific principles of conservation management and also the development of machinery and management methods to benefit wildlife. Considerable research has been carried out (full list held on file). Of particular note was the study on the origin of the Holme Fen posts by Hutchinson and a long-term study of tree growth by A.S. Gill.

Demonstration

There have been some limited demonstration events of machinery such as the stone-burrier and the tree puller.

1.7 Access Features

Accessibility and visitor appeal, public transport routes, access routes and visitor facilities

Access Classification	Champion	Destination	Other	
				✓
Access Plan Category	Open	Managed	Restricted	Excluded
	✓			

Visitor Appeal and Suitability for Access

Holme Fen is situated in a typical Eastern England landscape, resulting from intensive agriculture and as such has high intrinsic appeal as an oasis of natural countryside. This is undoubtedly appreciated by many visitors to the reserve who express their pleasure in just being able to walk within such an area, particularly with their dogs. The woodland rides attract general country lovers but also botanists and other naturalists appreciate the other wildlife.

As the rides are sometimes quite wet and the sub-strate easily damaged it is not suitable for large numbers of visitors, horse-riding or more than occasional cycling in dry weather.

Access Provision

Until 1992, general visitors to the NNR were confined to those permit-holders with an interest in particular aspect of natural history. About 500 permits were issued annually. With the open access policy, visitor numbers have increased to at least 15000 visitors annually (mainly dog-walkers), and this is likely to increase as Rymes reedbed develops and attracts more visitors to access to the Trundle mere Lookout.

Access by public transport is virtually non-existent, although there is a weekly bus from Holme to Yaxley. There are regular buses from Yaxley to Peterborough, but this is 4km distant.

There is a proposal (2014-2020) by Railtrack to close all the level crossings alongside the NNR which will impact on the ability of visitors to reach the site.

Visitor Facilities

There are two hides, one on each of the meres, but continual vandalism makes it difficult to maintain them to a high standard. The one on Burnham's Mere is now just screen. In addition the old nature trail around the back of the posts past the rhododendron plot and charcoal kiln has been re-instated.

As the reserve forms part of the Great Fen project area together with Woodwalton Fen NNR it is considered reasonable to direct most disabled visitors to Holme Fen where there is an easy-access path to the viewing point on Burham's Mere. In 2010 an all-access footbridge was installed over Holme Lode drain allowing better access to the Posts.

There are also facilities at the Countryside Classroom in Ramsey Heights, run by the Wildlife Trust as part of the Great Fen, which includes an all-terrain electric wheelchair.

1.8 Summary of Site Features

Tables summarising the site's features of importance

Table 1.8.1 Geological and Biological Features

Feature No.	BAP Broad Habitat Type or Geological Site Type	Specific Feature	Explanation of Feature/Ranking	Legal Site Designations						Other Classifications						
				SAC	SPA	Ramsar	Other	SSSI	GCR	European	National	Nationally	Nationally	Protected	Character	Other
1	Mixed deciduous woodland	W16 <i>Quercus</i> spp. – <i>Betula</i> spp. – <i>Deschampsia flexuosa</i> woodland / W6 <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland / W2 <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland	Semi-natural woodland					✓								
2	Wet woodland	W4 <i>Betula pubescens</i> - <i>Molinia caerulea</i> woodland W2(b) <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland, <u><i>Sphagnum</i> ssp sub-community.</u> Red Data Book Vascular plant: Fen woodrush <i>Luzula pallidula</i>	Wet woodland a. Relict Mire habitats invaded by birch. Vascular Plant					✓		✓						
3	Peat Body		Relatively						✓							

			undisturbed peat profile within Sphagnum peat well represented.															
4																		

Table 1.8.2 Landscape Features

Feature No.	Specific Feature	Explanation of Feature/Ranking	Legal Designations				Other Classifications	
			World Heritage Site	National Park	AONB	Heritage Coast	Joint Character Area	Other
			✓					

Table 1.8.3 Archaeological & Historical Features

Feature No.	Specific Feature	Explanation of Feature/Ranking	Legal Designations				Other
			World Heritage Site	Scheduled Monument	Listed Building	Register of Historic Parks/Gardens	Other
	Holme Fen Posts				✓		

Table 1.8.4 Socio-economic Use

Feature No.		Very Important	Important	Insignificant
	Economic Use			✓
	Community Involvement		✓	

Table 1.8.5 Education, Research & Demonstration

Feature No.		Very Important	Important	Insignificant
	Education		✓	
	Research		✓	
	Demonstration		✓	

Table 1.8.6 Public Access

Feature No.		Very Important	Important	Insignificant
	Public Access		✓	

Table 1.8.7 Other Estate Assets

Site assets, not listed in preceding summary tables, which the management plan needs to address

Feature No.	Asset Description	Notes
	Bird-watching hide	2
	Board sluices	3

	Fen posts	2
	Gates – vehicle	3
	Hard-surface path	140m
	Interpretation board	3
	NNR signs	8
	Pedestrian bridge	2
	Post/rail fencing	100m
	Post/wire fencing	450m
	Valves	2
	Vehicle bridge	2

References

Gill A.S. 1981 *Variation in Genus Betula* University of East Anglia L. in East Anglia (unpub)

Hutchinson J.N 1978 *The record of Peat Wastage in the East Anglian Fens and Holme Post 1848-1978* Dept. of Civil Engineering, Imperial College, London

Wallis S. 2014 Whittlesey Mere – a Resource (unpub)

Table 1 Individual designated interest features

BAP Broad Habitat type / Geological Site Type	Specific designated features	Explanatory description of the feature for clarification	SSSI notified interest features	SAC qualifying interest features	SPA qualifying interest features dependency on specific habitats			Ramsar criteria applicable to specific habitats			
					Annex 1 species	Migratory species	Waterfowl assemblage	1a Wetland characteristics	2a Hosting rare species &c	3a 20000 waterfowl	3c 1% of population
Mixed Deciduous Woodland	W16 <i>Quercus</i> spp. – <i>Betula</i> spp. – <i>Deschampsia flexuosa</i> woodland / W6 <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland / W2 <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland	Semi-natural Woodland	*								
	W4 <i>Betula pubescens</i> - <i>Molinia caerulea</i> woodland	Wet Woodland	*								
Wet Woodland	W2(b) <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland, <u><i>Sphagnum</i> ssp sub-community.</u> Red Data Book Vascular plant: Fen woodrush <i>Luzula pallidula</i>	Semi-natural woodland Wet woodland Relict Mire habitats invaded by birch. Vascular Plant	*								

NB. Features where asterisks are in brackets (*) indicate habitats which are not notified for specific habitat interest (under the relevant designation) but because they support notified species.

Table 2 Habitat extent objectives

Extent - Dynamic balance	To maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards.
	On this site favourable condition requires the maintenance of the extent of each habitat type (either designated habitat or habitat supporting designated species). Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.

Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source/estimate	Site Specific Target range and Measures	Comments
Mixed deciduous woodland	233 ha (from MapInfo, 2008)	Maintain at least 90% of current extent of woodland (W16/W6/W2). Extent to be measured by a combination of field survey and aerial photography.	The reserve has the largest lowland birch woodland in England, and this feature should be retained, though as natural succession occurs the woodland may become more mixed in nature. Some woodland loss is acceptable where required to extend open mire and heath habitats e.g. the area in Compartment 18 for which the objective is to have open conditions and raise local water levels to create conditions for the development of peat forming mire vegetation.
Wet Woodland	c5 ha (from MapInfo, 2008)	Approximately 2.5 hectares comprises W2b woodland, where the preferred aim is to restore hydrological conditions for less nutrient demanding bog-mosses Sphagna to thrive. The remainder comprises W4 (along with W2 and W6 referred to in mixed deciduous woodland for ease of assessment) which is localised through the wood.	

Audit Trail**Rationale for habitat extent attribute**

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

Currently there is no detailed Phase 2 NVC survey of Holme Fen, and the maps in the Management Plan are too general for defining the boundaries of the key habitats. Therefore the estimated areas for each habitat type may be subject to a degree of error. There are transitions between the many habitats on the site, particularly between woodland, heath and acid grassland habitat and the accepted boundaries of the various types need to be defined accurately following an NVC survey of the site.

Rationale for site-specific targets (including any variations from generic guidance)
Other Notes
From comparison with the NVC text, the drier birch woodland, does not completely accord with descriptions of woodland communities given there. The closest match appears to contain elements of both W16 and W10. Until further site survey information has been obtained, the community is described as W16.

**Holme Fen NNR
Management Plan
Part 2 2015-20**

2.1 Site Analysis

The issues which have positive and negative effects on the management of the site

Site Strengths	Site Weaknesses	External Opportunities	External Challenges
<ul style="list-style-type: none"> • Nationally important for species and habitats. • Relatively undisturbed peat profile • Well documented historical and cultural associations. • Well documented management and species records. • Strong intrinsic appeal as an oasis of natural countryside. • High diversity within a relatively small area. • Part of Great Fen Landscape Area • Increased water levels in adjoining Great Fen land may bring opportunities for re-establishing peat-forming vegetation on the NNR 	<ul style="list-style-type: none"> • Isolation within an area of intensively drained arable farmland. • Relatively small size with a number of habitats reliant on intensive management to perpetuate their interest. • Suite of species with very restricted national distribution. Vulnerable to adverse habitat changes/management practices/climate change etc. Limited or no prospect of successful emigration from the NNR • Internal Drainage Board arterial drains pass through the NNR • Lack of staff resource • Excessive dryness of site leaves it vulnerable to fires • Excessive numbers of muntjac 	<ul style="list-style-type: none"> • Heart of Great Fen project bringing opportunities to link to Woodwalton Fen and create huge 'buffer' around NNR • Great opportunities for engaging local communities. • Working with partner agencies, both as Great Fen project partners but also research and business involvement. • Wide opportunity to demonstrate good practice, both in habitat management and landscape-scale ecosystem services approach. • Involvement of volunteers in habitat management, species recording and education. • Dedication as Open Access offers greater opportunities for public enjoyment (but see 'Challenges') 	<ul style="list-style-type: none"> • Greater public access may compromise <i>Sphagnum</i> moss areas, some species of ground-nesting bird such as woodcock and cause infrastructure commitments such as providing boardwalks etc. • Agricultural drainage and continued arable farming around site • Insufficient precipitation to promote development of peat-forming vegetation (climate change)

2.2 Site Management Policy

The broad management policies for the site and the reasons why these options have been chosen

Background - Landscape and Historic Features

Most of the reserve area has not been dug for peat, making this one of the last remaining pieces of the ancient East Anglian fenland with a relatively intact peat profile. The vegetation history is therefore more completely preserved than anywhere else in the Fens and makes the site important for studies of Flandrian-sea-level change. An extensive series of peat cores has been taken, both historically (this was the location of Prof. H. Godwin's research in the 1960s) and more recently by S. Boreham and students at Cambridge University. The Oxford Archaeology group also carried out extensive investigations of the peat profile in 2013 in the Rymes reedbed area adjacent to the NNR.

These studies provide conclusive evidence that the vegetation of the Holme Fen area has changed greatly over the past millennia in response to climatic variations and resulting hydrological conditions. Following the post-glacial forest, various woodland types have been succeeded by fen, reed and raised mire vegetation. At the time of the drainage of the Whittlesey Mere in 1851 raised mire vegetation covered most of the site with pockets of birch, open water and reed, as evidenced both by peat analysis and contemporary records by botanists such as John Clare and the Marchioness of Huntingdon. Locally, fen flushes with more base-enriched vegetation of wet oligotrophic conditions such as the bryophyte *Scorpidium scorpioides* and occasional trees, would have persisted within this system, influenced by calcareous water draining from the Oxford Clay hills to the south and west of the reserve. Traditional fen practices such as mowing for litter, reedcutting, grazing by sheep and cattle and probably localised peat cutting almost certainly preserved an open landscape of fen meadows, marshes, reedbed and waterways around Whittlesey Mere.

Since drainage of Whittlesey Mere in 1851 the raised mire has been replaced by birch woodland as part of succession following drainage of the mere and subsequent conversion of the land to arable farming. Parts of the wood are Victorian plantings and these have survived as mature oak, and mixed conifers including larch and Scots pine.

Evaluation of NNR development

Successive designations, from Command 7122 in 1947 to the most recent SSSI criteria, have varied somewhat in evaluating the site interest. Early designations mistakenly assumed that there was extensive mire vegetation; others valued the historical peat profile while more recently the birch woodland interests along with some current (and sometimes transitory) rare species have been given greater emphasis.

The present structure of vegetation on the NNR has developed in the post-drainage of Whittlesey mere phase and is largely two types of woodland – mixed deciduous woodland (dominated by birch *Betula* spp.) and wet woodland. Within both types of woodland, however, there remain small but important areas of acid grassland, open water in meres and dykes, calcareous fen and acidic mire.

Since NNR declaration management has been constrained by the need to maintain a route for agricultural drainage water and little active management has been done historically, apart from the excavation of two large meres in the 1980's to create additional wetland habitat, ride and glade mowing and control of invasive species such as bracken and bramble in the heath areas.

The diversion of two of the arterial drains in 2003, however, has made it possible to raise water levels within parts of the site and could eventually lead to the development of areas suitable for peat-

forming vegetation. This will also rely on the continued progress of the Great Fen and raising water levels in the low-lying land on the old Whittlesey Mere to the east as well as suitable climatic conditions.

If the current state of the site is evaluated within a framework of its historical context and its potential for the future, it becomes clear that the relatively undamaged peat body offers not only a unique opportunity for research but importantly the potential for at least parts of the site to develop to fen and raised mire if hydrological conditions improve and there is sufficient precipitation. This is not to devalue other interest features which have developed since drainage, but places the current man-induced situation firmly in its historical context.

The present birch woodland is essentially an artefact of man-made drainage and would undoubtedly change if hydrological integrity was restored. The reasons why this has not occurred since the site has been an NNR are threefold: the priority given to arable cultivation over nature conservation, lack of clarity as to the biological value of the site and its isolated location.

There is tension between the importance of the NNR as a woodland site and as a relict example of the raised mire which once bounded Whittlesey mere. Until relatively recently, there was little prospect of maintaining the conditions for survival of the tiny area of *Sphagnum* vegetation, let alone increase it. Since the diversion of two of the Main IDB drains in 2002, however, and the purchase of land to the west of the reserve by the Wildlife Trust as part of the Great Fen, it has become more feasible to raise water levels within the site. A project appraisal (**Low 2010**) looked at the various studies which were carried out in the 1990s and 2000s and concluded that there is merit in raising water levels and carrying out limited tree removal to provide conditions which could promote the development of fen. Eventually it is hoped that peat-forming vegetation may also develop in some areas although it is far from certain whether or not this would actually occur. The unpredictability of the effects of climate change on rainfall (including possible droughts), and particularly the high probability of decreased summer rainfall, is of concern as any development of raised mire would require high rainfall (recent evidence from European sites suggest that this may not be as crucial as once thought, R. Lindsey pers. comm.).

Current habitats and species and management to date.

Over the last 10 years, the site has gone through a period of increasing tree height and intensive deer browsing which has led to loss of herb layers within the woodland and subsequent spread of open ground flora such as *Corydalis* and *Dryopteris* ferns. Deer control has resulted in the resurgence of bramble and tree regeneration.

Diversion of IDB drains and installation of water controls has raised the water table in some compartments. Whilst this is welcome from a habitat point of view, it has caused access issues which have meant that duckboards are now necessary for long periods.

Current habitats are evaluated below:



Woodland

The major scientific importance of the reserve as stated in the NCR was the size and homogeneity of the birch woodland – considered to be the finest development of this type of woodland in lowland Britain. Earlier opinion - as stated in the 1958 Management Plan - was that management should be aimed at retaining this purity of birch due to its value for experimental research, because of the relatively homogenous stands of different ages of birch, covering almost the entire life span of birch (Ovington 1955). It was further stated that the site would be valuable in enabling research to be undertaken into the ecology of the varying developmental stages. In practice, however, no research into the development of the differing age-classes of birch has been undertaken in the intervening period with the exception of a long-term study in ct. 17 carried out by Dr. Gill of the University of East Anglia. In addition, all the available evidence is that mixed broad-leaved woodland is a richer ecosystem than a mono-culture (e.g. S. Wells for fungi, R. Key for invertebrates, pers. comm.). These changes in perception of the value of the woodland can perhaps be attributed to the increased knowledge of ecosystems developed over this time period and modern interest in landscape-scale rather than site-based nature conservation.

The last Management Plan identified a limited area (cts.1 and 2) in which birch purity should be maintained, although it is unlikely that active management will be required here in the medium term. The rest of the woodland area was designated as essentially non-intervention, with the exception of controlling the spread of alien species like rhododendron and sycamore. Due to problems of low water levels, deer browsing and bracken invasion, however, there may be a need to intervene in limited areas to actively encourage regeneration and prolong the life of over-mature trees by coppicing and limb pruning

Broadleaved semi-natural woodland continues to cover most of the site. This is predominantly birch *Betula* spp. but the Victorian plantations of oak *Quercus robur*, larch *Larix decidua*, poplar *Populus canadensis* and other conifers are now reaching considerable maturity. There is increasing occurrence of other species coming through as the birch ages. Oak *Quercus* spp., alder *Alnus*, yew *Taxus baccata* and holly *Ilex aquifolium* are the most common of these, with oak being the most

dominant in the drier areas and alder along old dykes and areas like ct.15. Although recruitment has been severely curtailed in recent years by deer browsing, the situation has improved following introduction of deer stalking - holly in particular demonstrating dramatic resurgence in ct. 16.

A major feature of the woodland is that ecotones between woodland/scrub and scrub/grassland are not well represented and shrub growth around and within the woodland is restricted, with the exception of stands of elder *Sambucus niger* in cts.15/20 and 35/41. There are a few scattered bushes of hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa*, sallow *Salix cinerea* and a few alder buckthorn *Frangula alnus*.

Management has been confined to controlling invasive species such as rhododendron and sycamore, preventing birch encroachment on to surviving areas of bog myrtle and saw sedge and clearing fallen or dangerous trees.

Many trees have fallen in recent years, particularly in the gales of 2013-14 winter. It is unclear whether the raising of water levels will give the trees more purchase in the ground or contribute to root rot (this has happened at Chippenham Fen NNR). In any event, there are some over-mature oak and Scots pine within the reserve which may fall unless treated as veteran trees and pollarded. Once a decision has been taken about the bog and where it might be, a decision can be made as to the future of these trees. The raising of water levels, whilst it may negatively affect the birch could lead to the development of wet woodland dominated by alder etc.

Increased deer browsing over the last 10 years and the general increase of tree height have both contributed to a reduction in the herb layer, particularly bramble, and inhibited tree seedling recruitment. Despite the creation of open areas within the woodland due to storm driven tree fall, dominance of bracken in some areas also hampers seedling establishment. This combination of factors has resulted in a much more open woodland structure. Ironically, the reduction in dense herb layer has allowed a dramatic spread of *Corydalis claviculata*, which has now spread from an extremely restricted distribution to covering a significant proportion of the NNR. Since 2010, there has been a resurgence of bramble as deer numbers have fallen.

A steady decline has been recorded over the last two decades in breeding nightingales and other warblers of dense vegetation and scrub and this is also likely to be attributable to the loss of the herb layer and a more open structure.

Despite the abundance of honeysuckle, the white admiral butterfly population has always been intermittent and no butterflies have been recorded for at least 5 years. This may in part be due to the decrease in bramble due to deer browsing.

Red kites were first recorded as breeding in 2008 and buzzards also almost certainly breeding, although no actual nests have been identified.

Deer Management

There are relatively few records of wild native deer in Holme Fen, but since the release of muntjac and Chinese water deer in the area in the 20th century numbers of these non-natives increased. Until the mid 1990s, there were roughly equal numbers, but Chinese water deer are now rarely seen while muntjac numbers have increased greatly.

After considerable changes in understory and field layer structure as well as decline in breeding warblers it was decided to initiate muntjac control in 2006 under licence by the Abbots Ripton Deer Control Group by shooting from towers. During that period over 300 deer have been shot. From general observations and monitoring by Dr.A.S.Cooke the reduced deer numbers appear to have had an effect on the woodland/herb layer structure in that species like bramble are recovering and there are more tree seedlings surviving. Meanwhile sightings of roe have increased since 2013 although it is not known whether or not this is directly correlated with the reduction in muntjac numbers.

At a meeting on 5th October 2014 between Cambridgeshire and Northamptonshire SRMs and the Abbots Ripton deer stalking group, it was agreed to maintain a relatively low level of deer control and review any changes in breeding warbler numbers and botanical and invertebrate interest.

Standing Water (Dykes, Ponds, Meres)

Dykes

The only dykes which still retain water for more than short periods are situated at the north end - Forestry Dyke and Ralph's Dyke - and alongside the southern boundary of ct.3 which is seasonally wet. As most other dykes within the site are dry and in many cases colonised by trees, these are an important habitat for aquatic plants and invertebrates.

These dykes have been maintained by a programme of rotational slubbing and preventing excess loss of water into the Internal Drainage Board (IDB) drains, although reliable impermeable dams have not been fitted.

In 2002, two arterial drains – New Long Drove and Caldecote – were blocked at either end and the drainage routed around the eastern edge of the NNR. Potentially this presented the opportunity to raise water levels in these ditches and begin to stem the seepage from the site into the agricultural system. This has been successful with Caldecote dyke, as two new sluices at the corner of the reserve and another further east has allowed levels to build up in winter, not only in nearby Summer Standing fields but also in the NNR itself, with some minor ditches holding temporary water for the first time for many years. Due to the topography, more sluices are needed to allow further raising of water levels. There are consequences for public access with this policy as the nearby rides are becoming wetter.

On New Long Drove the water level remained fairly low due to lack of input into the drain due to the re-routing of drainage from Top Farm, during the winters of 2012-13 and 2013-14 high rainfall raised the level significantly.

Ponds

There is one pond in the centre of ct. 3 which appears to be above the water table and filled by rainfall and another in ct. 50. A further site on the edge of ct. 18 only occasionally holds water.

The ponds should be preserved as a local source of aquatic habitat and managed by occasional scrub clearance and cleaning out.

Meres

Two meres were excavated in the 1980s and cover an area of c16ha and are an important undisturbed open water resource for wildfowl. The edges provide good habitat for plants such as golden dock *Rumex palustris* and heathers *Calluna* and *Erica* spp.



Dry Heath/Acid Grassland/Marshy Grassland

The remaining areas of acid grassland/heath are an important sub-regional feature. There has been considerable effort in the glades in cts. 3 and 18 by clearance of birch, bracken and bramble control and hand pulling of birch seedlings to promote the resurgence of acid grassland / heath. This has been successful in that there is considerable spread of *Calluna* in ct. 18 and *Erica* in ct.3, accompanied by other species such as *Molinia caerulea* and *Hydrocotyle vulgaris* in the damper areas of ct.3. Bracken and birch remain a threat to the flora here and further control will be necessary. It is considered likely that if any attempt is made to re-establish peat-forming vegetation the heath areas in ct. 18 will be the most suitable locations.

The diversity of the grass fen in compartment 42 has been improved by annual cutting and removing the vegetation. While this has reduced the vigour of bracken the field remains quite coarse with few species of note and the compartment has never achieved the damp conditions envisaged when the adjacent mere was created. Meadow rue *Thalictrum flavum* has persisted, however, providing important habitat for the marsh carpet moth despite a decline, possibly due to a short period of sheep grazing. Ponies and cattle grazing now graze in most years with the two remaining meadow rue colonies protected from grazing, resulting in profuse flowering. Ground conditions are becoming increasingly uneven, making tractor mowing more and more difficult, which is why grazing was introduced.

Swamp, fen and mire

Swamp vegetation (S4) with reed as the main dominant is restricted to small areas around the edges of the meres and a few locations within the woodland where some degree of wetness persists.

Fen and mire

Important sub-communities in this woodland-type include the *Sphagnum* in ct. 5 and some fen areas

including *Carex* spp. *Phragmites australis* and *Calamagrostis* spp. in other areas. The small area of *Sphagnum* moss in ct. 5 is considered to be a relict of the raised bog which once occurred extensively across the site. The main small area of relict 'bog' flora which has survived in ct. 5 is now reduced to two or three species of fen *Sphagna* but in other areas saw sedge *Cladium mariscus*, bog myrtle *Myrica gale* and other mire species such as *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, and purple moor-grass *Molinia caerulea* also survive. In damper areas, particularly ct. 18, these communities are intermixed with a moss flora which could be a 'nursery' for *Sphagna* given a higher water table and sufficient rainfall.

Management here has concentrated on removing excessive tree and scrub growth from the *Sphagnum* areas, and removing part of the oxidised layer of vegetation and peat to try and stimulate moss regeneration. This has been a limited success but it may be too early to tell whether this management should be extended. Dipwell monitoring has continued.

As already stated for woodland, the Options Appraisal of 2010 and subsequent consultation with ecological experts within Natural England as well as external specialists has explored the tension between maintaining the site as predominantly birch woodland, and encouraging wetter conditions which may lead to a re-emergence of wetland vegetation including raised mire. It is impossible to guarantee that raising the water table would be successful in allowing bog to become established but the overall view is that a gradual increase in the water table in at least parts of the site will at the very least be unlikely to damage current interest features such as fungi and research is planned to assess fully any effect on the fen woodrush.

Socio-economic Use

There is little scope for this within the present NNR, apart from casual visits by mainly dog-walkers but there are many opportunities in the wider Great Fen area and an increased in visitors is expected as Rymes reedbed becomes more attractive to birds.

Education, Research and Demonstration

Holme Fen is not widely used by educational groups, but a considerable amount of research has been carried out. There have been some limited demonstration events to test machinery etc. and there are opportunities for all these activities in the future.

Much of this activity would also be usefully developed across The Great Fen.

There has been considerable geological and archaeological investigation as part of the planning process for the conversion of Holme Lode farm to 'Rymes reedbed' and there is a great potential for further research.

Public Access

Public use of the NNR has definitely increased, as has the number of walkers bringing several dogs onto the site including at least one group who 'professionally' exercise up to 14 dogs. Unruly dogs have caused some complaints from other users.

Opportunities for public access and involvement exist on various levels:

1. Visitors
2. Volunteer work parties
3. Voluntary Wardens

1. In the summer of 1992 the permit-only system was dropped in favour of an open access policy with

the addition of a 'no dogs' policy. Welcoming more visitors to the reserve is seen as a positive move to encourage more interest from the general public, rather than just committed naturalists, but the effects of greater access will need to be carefully monitored.

As the number of visitors has increased, the condition of some of the paths has deteriorated as the ground has become compacted and waterlogged. With the likelihood that the Great Fen visitor centre will be close to the NNR a policy must be developed as to how to deal with the pressure of more visitors. In June 2014, the NNR was dedicated as open access. Although this may lead to more difficulty in preventing damage to sensitive areas it does mean that it will be possible to require dogs to be on leads during the bird breeding season, although this will only be effective if more time can be spent patrolling. Many visitors come specifically to see the Holme Posts.

There is a probability that Rail-track will close the level crossings on the B660 and Holme Lode ('Queenie's'). This may lead to a decrease in access to this part of the NNR but is likely to have far-reaching effects for access to other areas.

One consequence of raising water levels in the NNR which will be the effect on public access. Already, two successive wet years coupled with the installation of control sluices in Short Drove dyke has led to local water-logging of rides and the need to provide duckboards for walkers. Although far from certain, a higher water table may also lead to increased tree fall due to root rot so increased vigilance in safety checks may become necessary, particularly as the site is due to become dedicated as open access and so preventing the public from accessing area of dense tree cover may become difficult.

2. Volunteer work parties have traditionally worked on the site at least three times per annum and this is likely to continue. Since 2009 Great Fen volunteer work parties have been run every 3 weeks, led by NE or Great Fen staff.

3. Voluntary wardens continue to be recruited and a weekend ranger service now works across the Great Fen, including patrolling of the NNR.

Site Extension/Protection

Holme Fen suffers from its isolation and the need to drain agricultural land through the NNR. This was the reason for the extinction of the 19th century mire and the development of birch woodland. Even if the remaining two IDB drains are diverted and water levels within the NNR are raised, management within the confines of the site boundaries cannot address the wider issues of isolation and irrigation by nutrient-rich water. These remain intractable problems for the long-term protection of species and habitats, and may become particularly acute if climate change makes some habitats unsuitable within the confines of the reserve. Plans to bund the site with a plastic or clay liner were abandoned in favour of development of the Great Fen project in 2001. **This project remains the most effective means by which to ensure the long-term future of fen habitats in Holme Fen, provide conditions which may lead to re-creation peat-forming vegetation in some areas and aid the expansion of species out of the NNR and into the surrounding countryside.**

By the beginning of 2010 the Wildlife Trust on behalf of the Great Fen owned all the land around the NNR. The tenants on Ladyseat Farm have exercised their right to continue arable farming, which restricts the wider development of wetland but the tenancy of Engine Farm was acquired by the Wildlife Trust in 2013 so a large area of the former Whittlesey Mere can be now be put into conservation management including the area of Holme Lode farm which was subject to a major habitat creation scheme (Rymes reedbed) in 2013-14 and which will raise water levels around the northern part of the NNR. This allows the possibility of some form of 'lagg fen' developing around the NNR which in turn will increase the possibility of creating some form of mire conditions.

Climate Change

It is difficult to have a full understanding of the extent that climate change will affect Holme Fen as the water levels are controlled by the local IDB and historically NNR condition has been constrained by the

need to maintain a route for agricultural drainage water. Future developments in adjoining land now controlled by the Great Fen partners may reverse this trend.

The original raised mire has been replaced by birch woodland as part of succession following drainage of the Whittlesey Mere and subsequent conversion of the land to arable farming. The division of two of the arterial drains in 2003 has made it possible to raise water levels within parts of the site. Drainage has lowered soil water levels within the extensive peat deposits of Holme Fen and also caused extensive and long-term peat wastage; the elevation of the ground surface has fallen by around 4m at the Holme Past within Holme Fen (Hutchinson 1980, Gillman 2003). Damaged peatlands are substantially less resilient to climate change than healthy ones.

Holme Fen lies within the Great Fen area and one of the key reason for starting this project was to solve some of the considerable problems affecting favourable condition on both Holme Fen (site damaged by agricultural drainage) and Woodwalton Fen (site used for floodwater storage). As the project has developed it has embraced many other issues such as climate change adaptation and ecosystem services. So securing future biodiversity on the NNR remains a key factor and the long-term future is inextricably bound up with the development of Great Fen. Re-wetting the Fens offers an important opportunity to halt the loss of carbon from long-term soil stores. Other external factors that will affect Holme Fen are the East Coast railway line and levels of water abstraction.

Using the CP09 Climate change projections using a medium emissions scenario
Projections for the East of England in the 2050s are:

- Increased variation within and between years in temperature and rainfall patterns
- Increased frequency of extreme events such as drought and heat waves
- More precipitation will fall in the form of extreme rainfall events
- Increase in winter mean temperature is 2.2°C (1.1 - 3.4°C.)
- Increase in summer mean temperature is 2.5°C (1.2- 4.3°C).
- Increase in summer mean daily maximum temperature is 3.4°C; (1.3-6.0°C)
- Increase in summer mean daily minimum temperature is 2.7°C (1.2°C -4.7°C)
- Change in annual mean precipitation is 0%; (-5- +5%.)
- Change in winter mean precipitation is 14% (3-31%)
- Change in summer mean precipitation is -17% (-40 - 14%).)

Brackets indicate changes which are very likely to be exceeded, and very likely not to be exceeded (10 and 90% probability levels, respectively)

The ambition of the Great Fen project partners is to raise water levels in the area and this may serve to mitigate some of the negative effects of climate change, for example, drought conditions and lower precipitation. The assessment of the feasibility, benefits and cost of restoring Lowland Raised Bog habitat at Holme Fen, however, (Low 2010) indicates that lower precipitation could be a major factor against the restoration of LRB at Holme Fen, although other workers (eg R.Lindsey pers. comm.) dispute this.

Management Policy for long-term future of the NNR

The succession of vegetation at Holme Fen has been very dynamic over the centuries and particularly so since drainage of the mere. The birch and mixed woodland which has developed in this time has undoubted value for nature conservation, with an impressive list of fungi species and characteristic and rare fenland plants and invertebrates as well as bird populations. In the relative absence of intervention the development of the present woodland is also an interesting study in itself. The woodland is also much valued by the general public, whose main activity is dog-walking. Of great geological importance is the fact that Holme Fen is rare in retaining the upper layers of peat which are absent from most of modern fenland. Not only is this valuable for study of climatic change and vegetation succession over the millennia, but also creates the potential to re-establish lowland raised bog which was once extensive here before the drainage of Whittlesey Mere.

Due to increased water levels in some land managed by the Great Fen partnership around the NNR (particularly Rymes reedbed) and the raising of water levels in two of the arterial drains it is possible that some form of lagg fen/reedswamp may develop around parts of the NNR as well as slowing seepage from within the peat body (lagg fen often develops at the borders of raised bogs). Consultation with ecologists both within and from outside Natural England suggests that if water levels over at least parts of the NNR are gradually raised in this way, it may initiate a gradual change in woodland composition from birch-dominated to a more mixed woodland with a predominance of water tolerant species such as alder and willow. In more open areas fen may become more widespread and could eventually create conditions for peat-forming vegetation, although climate change predictions cast considerable doubt over whether there will be sufficient precipitation for this to actually occur. The more open dry heath/acid grassland areas such as ct. 18 already have well-developed bryophyte communities and it is here that it is most likely that these changes could occur, although a challenge to increasing the wetness of this area is that this compartment is higher than surrounding land.

The choice between maintaining present conditions or increasing water levels in the hope that a great biological diversity will result is not an easy one. The present value of the site in its relatively dry state needs to be carefully evaluated against the potential to create conditions similar to those pre-drainage with their associated wildlife species. In its present dry state, Holme Fen has developed into a rich wildlife resource much valued by the general public and naturalists alike. Increasing wetness is likely to change this state and considerable die-back of the birch may occur before wetland conditions establish. The residue of relatively undamaged peat profile is, however, a rare resource in East Anglia and there is now the potential to establish wetter conditions which may generate a dynamic and valuable range of habitats and species. It is by no means certain how successful this will be in initiating the formation of raised bog but an increase in fen and other wetland habitats would be a positive development to counter the many decades of degradation caused by agricultural drainage.

The Options Appraisal report gave rise to considerable concerns about the viability of successfully establishing raised bog on the NNR, particularly in the light of climate change predictions of possible droughts. Recent evidence from work in Germany to re-instate degraded bogs and accounts by Eddy and Daniels (1990), however, suggest that two mosses at least (*Sphagnum papillosum* and *S. palustre*) are capable of successful establishment in these conditions. R.Lindsey (pers comm) - University of East London, an acknowledged raised mire expert, is also convinced of the real possibilities of establishing fen conditions which would create conditions suitable for some *Sphagnum* establishment. In the early stages this is likely to be 'lagg' fen which can develop under wet groundwater conditions and does not rely on the rainfall which true bog *Sphagna* require.

The likely outcomes are therefore considered positive enough to initiate management to create better conditions in part of the NNR for increasing the area of wetland habitat, lagg fen and potential LRB (see Objective 3).

As a first step, efforts should be continued to divert the remaining IDB drains and raise water levels in the central parts of the NNR, whilst also reducing seepage by blocking outlets and capitalising on raised water levels in surrounding Great Fen land such as Rymes and Summer Standing. Where possible, internal water levels should be raised over areas such as ct. 18 to

enhance the small remaining fen and heath communities as a first step in encouraging the resurgence of lagg fen as a precursor to true LRB communities. In the light of current knowledge this would appear to be very unlikely to occur on the degraded peats of other areas of the Great Fen, although work is developing to grow Sphagnum under these conditions.

2.3 The Vision

A 50 Year Vision for Holme Fen National Nature Reserve

The reserve will be seen by many visitors as one of the most exciting areas of the Great Fen where the ultimate aims of the wider project are seen at their best. Although visitor numbers to the Great Fen will be in excess of 100000 per annum, the zoned approach to access has been successful in allowing a quiet and 'wild' feel to be retained on areas such as Holme Fen and the site of Whittlesey Mere.

Whilst Holme Fen will have become absorbed into the wider Great Fen it will have retained its special status and be used as a demonstration of management and research contributing to knowledge of management of other fenland sites, particularly the restoration of lowland raised bog. Land to the west of the railway will have been acquired by the Great Fen so that the new fen landscape continues almost as far north as Yaxley.

Breeding birds such as bittern and black-tailed godwit will be well established around the NNR and common cranes have a thriving population along with little egrets in the more marshy areas surrounding the reserve. Other breeding birds within the NNR include lesser-spotted woodpecker, and willow tit, which were lost in the 2000s, while nightingale and other scrub warblers will be thriving amongst the scrubby habitat which has become established on ex-arable land around the NNR where some fields were allowed to revert to their semi-natural state after 2012. The heronry is a notable local feature and extensive reedbeds border the eastern boundary of the site.

Increased wetness within and around the site as well as a return to more 'natural' conditions outside will have allowed a resurgence of areas of tall fen as well as the emergence of novel habitats as the effects of arable cultivation have dissipated. This will have benefitted plants, invertebrates and amphibians as well as perhaps having allowed the re-establishment of species such as fen violet and large copper butterfly onto the Great Fen.

Water storage facilities to the east of the NNR have been very successful in protecting surrounding communities from flooding, and raised water levels in Rymes and Kester's Docking have supplied water to reedbeds which provide habitat for bitterns, marsh harriers and bearded tits, as well as providing a source of thatching reed.

Raising water levels outside the NNR has also allowed some areas within the site to become suitable for growth of *Sphagnum* mosses and other peat-forming plants and form the basis of the eventual development of raised mire.

The effects of climate change may have negatively affected the ability of some species to survive whilst others, such as little egret, may well have colonised the reserve, being increasingly common around the Great Fen since 2010. Warmer temperatures may also favour invertebrates such as Hymenoptera.

2.4 Objectives

What we want to do during the period of the plan to take us towards realising the Vision

2.4.1 Geological and Biological Objectives

Objective 1: Subject to natural change, to maintain and where possible enhance condition of the mixed deciduous woodland.
NVC communities: W16 <i>Quercus</i> spp. – <i>Betula</i> spp. – <i>Deschampsia flexuosa</i> woodland / W6 <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland / W2 <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland
Features addressed by this objective: 1
Attributes/targets for key features:
Target structure: <ul style="list-style-type: none">• Understorey (2-5m) present over at least 20% of total stand area.• At least three age classes spread across the average life expectancy of the commonest trees.• Mature/old growth stands or a scatter of large trees allowed to grow to over-maturity/death on site (e.g. a minimum of 10% of the woodland or 5-10 trees per ha).• A minimum of 3 fallen lying trees >20 cm diameter per ha and 4 trees per ha allowed to die standing.• At least 95% of cover in any one layer of site-native or acceptable naturalised species.• Signs of seedlings growing through to saplings to young trees at sufficient density to maintain canopy density over a 10 yr period (or equivalent regrowth from coppice stumps)
Objective Methods:
Management methods <p><i>NB: These methods include actions on the related grassland and heath communities within the main woodland NVC.</i></p> <p><u>Woodland</u></p> <p>There is undoubted value in the birch and mixed woodland in its present state and so the policy of perpetuating the present woodland should continue. Due the dynamic nature of the woodland on the site, however, there is likely to be considerable natural change over time.</p> <p>Woodland-edge will, wherever possible, be encouraged to develop a shrub layer, which is of particular importance to invertebrates and birds such as whitethroat and nightingale. To help this process, the two fields to the south-west of cts.15b and 15c and to the north-east of ct.27 have been identified by the Great Fen partners as suitable for restricted management to allow the development of rough grassland, scrub and eventually woodland, which is likely to be birch dominated.</p> <p>Control of invasive species should continue as well as clearance of trees fallen across rides or those considered to be a risk to safety. This will require regular inspections by tree experts.</p> <p>Rides within the woodland should continue to be mown annually to maintain access. Ride-edges and glades have an important role as habitat for plants and invertebrates and mowing annually or on longer (2-3 year) rotation will maximise this potential whilst at the same time preventing encroachment by bracken and coarse grasses.</p>

Deer Management Policy

The control of muntjac should continue for the next 5-year period, in an attempt to control deer numbers to a level where a herb layer and tree regeneration exists but there are still areas of open ground for species such as fen woodrush and corydalis as well as invertebrates which thrive in warm open conditions.

Acid/Damp Grassland

The areas in cts. 18 and 3 will be maintained by mowing and control of invasive species such as birch and bracken.

In ct. 3 the ground level height of the compartment in relation to the water table in the dykes is a severely limiting factor to establishment of damp conditions away from dyke edges. Notwithstanding this, keeping the compartment mown is leading to the development of heather and other acid grassland species and should be continued where resources allow. Treatment of birch re-growth by weed-wiping should also be continued as necessary.

In the longer term grazing by goats or ponies may be initiated and a trial should be carried out during this management period.

Pulling and felling of saplings in the glades of ct. 18 has achieved a great increase in heathers and purple moor-grass, and these glades should continue to be kept open. Additionally, selective felling of larger trees around the edges of the glades will help to give more light to other *Calluna/Cladium* communities, and should be continued during this management period. Bracken control will also be necessary to encourage a more diverse community to develop. Rotational cutting should be introduced to ct. 18, where heather stands are of similar age and showing signs of senescence in some cases.

Other woodland-edge glades should continue to be mown annually or on rotation.

The 'Poor Fen' (ct. 42) has for some years been grazed by livestock. This is a welcome addition to the cut & gather regime of other open areas and should be maintained as necessary, although it is essential to protect the meadow rue plants from grazing, as they need to flower and produce seed if there is to be any possibility of maintaining a marsh carpet moth population. The use of the Highland cattle belonging to Huntingdonshire DC and ponies has been particularly beneficial. Limited ploughing of an area may be considered in order to encourage more diversity in the grassland and bracken control should be intensified.

Communities

Where bog myrtle and saw sedge communities occur at glade margins, particularly in cts. 1/2, 5, 18, 35, 44, invading birch should be controlled by periodic cutting.

Other important communities are the invertebrate and bird populations. The number and variety of breeding birds has declined as the understorey and field layer of the woodland has been lost, probably due to a combination of deer browsing and canopy closure. Deer control should be continued to help encourage the return of some areas of dense patches of understorey.

The retention of deadwood wherever possible provides excellent habitat for a wide range of invertebrates.

Open Water

Although plant colonisation of MacPhail's/Burnham's mere has been relatively slow, emergent vegetation is beginning to develop and it is considered that the future nature conservation

interest of the meres will be increased by allowing natural colonisation.

The two ponds in ct. 3 and 50, should be slubbed out periodically to prevent silting-up, and scrub around the edges kept under control.

Management of the two redundant IDB drains to maintain higher water levels should continue and efforts made to divert the two remaining IDB drains.

Ref: Gillman 2004 Holme Fen: hydrological assessment of the management of redundant drains. Report to English Nature

Monitoring Methods:

- Monitoring of vegetation communities will be undertaken under the Common Standards Monitoring Programme.
- A detailed NVC survey will be carried out once every five years Monitoring methods for the nationally scarce plants will be designed during the life of the plan.
- The rare invertebrates require specialist survey once in the five years of the plan to test their continued existence and so the specialist can advise on any management changes. These invertebrates have not been monitored adequately in the past.
- Other invertebrates will be monitored as opportunities arise.
- The effects deer browsing will be undertaken through continuation of Dr. A.S.Cooke's transects and bird census
- Regeneration of tree seedlings will be assessed
- Breeding warbler populations will continue to be monitored though BBS transect counts.

Objective 2: Subject to natural change, to maintain and where possible enhance wet woodland.

NVC communities: W4 *Betula pubescens-Molinia caerulea* woodland

W2(b) *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Sphagnum* ssp sub-community.

Features addressed by this objective:

2.

Attributes/targets for key features:

Target structure:

- Understorey (2-5m) present over at least 20% of total stand area
- At least three age classes spread across the average life expectancy of the commonest trees
- Mature/old growth stands or a scatter of large trees allowed to grow to over-maturity/death on site (e.g. a minimum of 10% of the woodland or 5-10 trees per ha).
- A minimum of 3 fallen lying trees >20 cm diameter per ha and 4 trees per ha allowed to die standing.
- At least 95% of cover in any one layer of site-native or acceptable naturalised species.
- Signs of seedlings growing through to saplings to young trees at sufficient density to maintain canopy density over a 10 yr period (or equivalent regrowth from coppice stumps)
- Area of developing Sphagnum-rich vegetation within open woodland canopy

Objective Methods:

Due to developments in the Great Fen surrounding parts of the NNR the opportunity now exists to gradually raise water levels over at least parts of the NNR and promote a change in woodland composition towards a wetter woodland type. Consultation with experts suggests that this may initially lead to a gradual change in woodland composition from pure birch to a more mixed woodland with a predominance of water tolerant species such as alder and willow. This may in turn lead in some areas becoming suitable for further development of the Sphagnum sub – community which already exists in ct. 5.

The wet field to the south-west of ct.28 has a similar objective, and this is more likely to develop to a wet scrub / woodland type. This will serve to replace any losses of woodland cover from the NNR as the water table rises and more fen / bog develops.

The ultimate aim of management is to enable the survival of the present restricted W2b sub-community at Holme Fen, whilst in other areas (see Objective 3) the long-term objective is to establish conditions where new ombrogenous raised bog community (which would have been a characteristic feature of the former Whittlesey Mere) can develop.

Monitoring Methods:

- The rare invertebrates require specialist survey once in the five years of the plan to test their continued existence and so the specialist can advise on any management changes.
- Other invertebrates will be monitored as opportunities arise.
- The butterfly transect will be carried out weekly by staff or volunteers between April and September, with data being supplied to the UK Butterfly Monitoring Scheme.
- Dipwell monitoring will be continued.

Objective 2: Subject to natural change, **to maintain and where possible enhance wet woodland.**

NVC communities: W4 *Betula pubescens-Molinia caerulea* woodland

W2(b) *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Sphagnum* ssp sub-community.

- The extent of the *Sphagnum* should be assessed at regular intervals and at least every 5 years.

Likely Significant Effect:

These proposals are necessary for nature conservation management of the site.

Objective 3: Subject to natural change, to maintain and where possible enhance wet heath M16 and lagg fen as a precursor to lowland raised bog (M18).

Features addressed by this objective:

2.

Attributes/targets for key features:

Target structure:

- Area of developing Sphagnum-rich vegetation initially within open woodland canopy
- Sphagnum communities developing in the open and forming characteristic hummock structure

Objective Methods:

Present hydrological conditions are considered to be unsuitable for LRB to expand in ct. 5. Water in Burnham's mere is unsuitable due to its mineral and nutrient content and it is considered more suitable to re-wet areas in ct. 18 which are remote from IDB drains and not affected by run-off from nutrient-rich sources, although the relatively high topography of this area does not make this an easy task. Further investigations of the hydrological conditions here should be carried out together with a topographical survey to establish ground levels to inform the likelihood of success of restoring conditions suitable for raised mire. Consideration should be given to blocking up the outfall from the ditch between the two heather glades

During Year 1 of this Plan a planned approach will be formulated as to how conditions can be further improved to achieve favourable condition for lagg fen / raised bog. Following this, the existing Water Level Management Plan will be considerably expanded and updated.

A first step towards encouraging LRB is to increase the present low ground water levels. An increase has already been noted where sluices have been installed in Short Drove dyke and further controls should be installed to increase the effectiveness of this.

A survey of brown mosses should be undertaken to assess the existence of any upwellings.

A topographical survey and peat core survey should be carried to establish levels and peat depths.

A staged approach is recommended:

Short / medium-term:

- Install further water controls in Short Drove dyke with appropriate water level management
- Expand clearings in ct. 18 to twice current area
- Raise water levels in the two dry ditches bordering ct. 18 and connected to Short Drove dyke in an attempt to create damper conditions within the clearing. In the longer term a wind pump might be installed to maintain appropriate water level within the isolated area.
- Create means of retaining water within the NNR at higher levels than surrounding Great Fen area. This could be achieved by control structures at upstream (south and west) and downstream (north and east) ends of lodes draining through the Fen. Install wind pumps at each control structure to transfer water into the Fen to maintain high internal water levels.

Longer-term:

Drainage of the low-lying farmland to the west of the NNR needs to be re-directed so that low

Objective 3: Subject to natural change, to maintain and where possible enhance wet heath M16 and lagg fen as a precursor to lowland raised bog (M18).

water levels do not impact on the site.

Options:

- Purchase upstream farmland west of railway and create flood storage so that water is not lost from the system by diversion and can be used to satisfy summer water deficits
- Re-route drainage north to Yaxley before water passes under the railway. (This may require a new pumping station)
- Create hydrological barrier to enable different water levels on west and east sides of railway. The integrity of the railway embankment will have to be preserved so any raising of water levels to the east should be a sufficient distance away to maintain this. As long as there remains a need to drain farmland to the west, a by-pass channel to the north-west (to Yaxley Lode) would be needed.
- One effect of isolating the NNR from water from the west is that it would potentially become even drier. Therefore a means is needed to allow transfer of water from west to east side of railway across the divide such that water levels can be higher on the east side. This could be achieved by a series of wind pumps.
- Pile the two northern IDB drains to retain present agricultural drainage without affecting the NNR.

The recommendations will need further consideration to assess their practicality, e.g. sufficient wind within the Fen to drive wind pumps, distance from water source to raised mire area, effectiveness of reeds in reducing pH.

Monitoring Methods:

- The rare invertebrates require specialist survey once in the five years of the plan to test their continued existence and so the specialist can advise on any management changes.
- Other invertebrates will be monitored as opportunities arise.
- Populations of *Luzula pallidula* should be closely monitored to assess any effects of raising the water table.
- Dipwell monitoring will be continued.
- The extent of the *Sphagnum* should be assessed at regular intervals and at least every 5 years.
- Monitoring effects of higher water levels on the integrity of the railway

Likely Significant Effect:

These proposals are necessary for nature conservation management of the site in allowing the re-establishment of lowland raised bog. Although they may effect some present features, a staged approach and close monitoring will allow changes to be made if necessary.

Objective 4: Subject to natural change, to maintain the peat deposit
Features addressed by this objective:
3.
Attributes/targets for key features:
<ul style="list-style-type: none"> • No loss of peat through peat digging or wastage. • Development of peat-forming vegetation
Objective Methods:
<ul style="list-style-type: none"> • A restricted area is designated as GCR for the importance of the peat deposit, but the whole site is important for this feature. • Vigilance to prevent unauthorised peat digging should be sufficient to prevent loss. • Raising the water table will help reduce further desiccation of the peat surface.
Monitoring Methods:
None specific
<i>Likely Significant Effect:</i>
<i>These proposals are necessary for nature conservation management of the site.</i>

2.4.2 Landscape and Cultural Objectives

Objective 5:
<u>Socio-economic use</u> To maintain the current level of socio-economic use of the site.
Features addressed by this objective:
All
Attributes/targets:
<u>Feature 6 : economic use</u> Target contribution of a farm enterprise : Maintain the use of external graziers cattle or ponies to supplement summer grazing. <u>Feature 7 : community involvement</u> Target community events : To encourage community events such as guided walks or talks where there is no conflict with nature conservation and is within the access strategy. Target volunteers : To have several volunteers to carry out essential wildlife monitoring and assist with reserve management work and maintaining contact with visitors. Contribute to the Great Fen 3-weekly programme of volunteer tasks and support the Great Fen Volunteer Ranger initiative.
Objective Methods:
<p>We will expand our programme of guided walks, assisted by Great Fen staff. These walks will be advertised on the Natural England website, in the local press and with posters on the reserve and at other local sites. Where possible, we will improve access for less able-bodied visitors. The likely development of a Visitor Experience Centre near to the site, however, will mean that most activities and access for less-mobile people will be concentrated here.</p> <p>We plan to maintain and ideally expand the current number of volunteers on the NNR. Our current volunteers deliver a lot of quality information to our understanding of the site. We would benefit from an increase in recording effort on the NNR and are keen to increase the range of volunteering opportunities. We will work with the Great Fen partners to merge all volunteers into the 'Great Fen'.</p>
<i>Likely Significant Effect:</i> <i>These proposals are not necessary for nature conservation management but will have no significant effect on the internationally important nature conservation features of the site.</i>
Monitoring Methods:
<ul style="list-style-type: none">• Volunteers are recorded on a register of volunteers and their time input is recorded at the end of every financial year.• The number of events facilitated by Natural England are recorded each year.

Objective 5
<p><u>Education, Research and Demonstration</u> To maintain a reasonable level of education, research and demonstration</p>
Features addressed by this objective:
All
Attributes/targets:
<p><u>Feature : 8 educational use</u> Target number of educational visits : No target</p> <p><u>Feature : 9 research</u> Target number of research projects carried out : No target</p> <p><u>Feature : 10 demonstrations</u> Target number of demonstrations : No target</p>
Objective Methods:
<p>We will encourage research on the site. We will work with volunteers and academic bodies to encourage research.</p> <p>We would like to encourage the following areas of research:</p> <ul style="list-style-type: none"> • The effects of grazing against mowing on the invertebrate community of the fen. • Study of rare plants and in particular the fen woodrush population • Investigate the possibility of re-establishing raised mire in some areas of the reserve. <p>We would welcome any suggestions for further research on the NNR.</p> <p>We will remain available to schools, colleges and universities for educational visits, should they request it and maintain close links with the staff at the 'Countryside Classroom'.</p> <p>We are keen to demonstrate the practical management techniques we employ on the NNR would be willing to deliver demonstration events to this end.</p>
<p><i>Likely Significant Effect:</i></p> <p><i>These proposals are not necessary for nature conservation management but will have no significant effect on the internationally important nature conservation features of the site.</i></p>
Monitoring Methods:
<ul style="list-style-type: none"> • The number of educational visits and demonstrations is reported annually.

2.4.3 Estate Asset Objectives

Objective 6
<u>Legal and other obligations</u> To fulfil all legal and other obligations arising from legislation, leases and legal consents etc
Features addressed by this objective:
All
Attributes/targets:
<u>Feature : 11 health and safety</u> Target compliance with legal obligations towards staff and visitors : 100% compliance; no incidents
<u>Feature : 12 livestock regulations</u> Target compliance with legal obligations including welfare, movements, biosecurity, identification, where not the responsibility of grazier: 100% compliance
<u>Feature : 13 waste disposal</u> Target compliance with legal obligations: Ensure all waste is disposed of within current regulations
<u>Feature : 14 felling licence</u> Target compliance with legal obligations : 100% compliance
<u>Feature : 15 protected wildlife</u> Target compliance with legal obligations : 100% compliance
<u>Feature : 16 cross-compliance</u> Target compliance with obligations : 100% compliance with statutory obligations for 'cross-compliance'.
Objective Methods:
<p>We will operate all health and safety procedures positively. We will undertake risk assessments and implement their recommendations. We will maintain a lone working buddy system. We will attempt to have all reserve staff trained in First Aid.</p> <p>We will appropriately train our staff and volunteers who use machinery.</p> <p>We will check trees for safety in a zoned manner according to risk.</p> <p>There are many obligations relating to livestock, including those concerned with welfare, movements, and animal identification. These are the responsibility of the livestock keeper, whether that be an external grazier or NE staff. We will undertake our responsibilities fully. Bio-security may become a legal obligation if foot-and-mouth, blue-tongue, bird flu, TB or other notifiable disease becomes present in the surrounding area. All legal precautions, plus extras if necessary, will be taken to prevent the spread of disease onto / off Woodwalton Fen. As legal restrictions may change rapidly during an outbreak, staff will vigilantly assess the situation.</p> <p>All normal commercial and domestic waste, including metal, plastics and paper for recycling will be disposed of through the District Council collection service. Materials for recycling will be collected separately and taken to the nearest recycling facility. Quantities of waste too large for</p>

Objective 6

this, such as old fencing material or fly-tipped waste on our land will be removed in skips hired for the purpose. 'Special' waste such as oil wastes or car batteries, pesticides or florescent bulbs will be taken to local authority collection points for recycling. Unwanted vehicle tyres will be taken to authorised tyre dealers for disposal or recycling. For other special wastes, e.g. fly-tipped asbestos or dumped cars we will contact the local authority for advice. We will comply with the legal obligation to keep records of waste transfer to authorised disposal sites or to licensed collectors. We will make sure our contractors (e.g. fencing contractors who generate old fencing material waste) supply us with copies of waste transfer notes to ensure that they also comply with legislation. Where we dispose of waste on-site, e.g. burning up to 10 tonnes of felled trees, we will apply for a waste disposal exemption, or licence for greater quantities. We will ensure our contractors do the same where relevant.

A felling licence is required for the felling of more than a small defined volume of wood. If necessary Natural England will apply for a felling licence for any of our work.

This management plan meets our obligations for SSSI / SAC / SPA management, but any changes will need further assents. Several protected species occur on Woodwalton Fen (see section 1) and we will comply with legal requirements regarding protection of these species.

We will comply with all Defra rules for keeping the land in 'Good Agricultural and Environmental Condition' as required by cross-compliance. This will enable the land to be eligible for the Single Farm Payment. We will oblige our grazier to do the same. In particular we will annually write a Soil Management Plan as required.

Likely Significant Effect:

These proposals are not necessary for nature conservation management but will have no significant effect on the internationally important nature conservation features of the site.

Monitoring Methods:

- Health and safety – by Natural England's East of England Health and Safety Committee
- Livestock regulations – informal monitoring by Reserve Manager
- Waste disposal – collection of waste transfer notes
- Protected species – informal monitoring by all staff (protected species), formal checks by Team Leader for SSSI / SAC / SPA assents.

Objective 7:

Internal/External Scheme obligations

To fulfil obligations arising from voluntary external and internal schemes.

Features addressed by this objective:

All

Attributes/targets for key features:

Feature : interpretation plan

Target usage :

Objective 7:

Possess and operate an interpretation plan as required internally

Feature : 17 green travel plan

Target usage :

Possess and disseminate a green travel plan as required internally.

Feature : 18 standards for visitor facilities

Target implementation :

To meet internal standards for visitor facilities.

We will continue to provide interpretation at the Holme Posts, as well maintaining the nature trail and hide facilities.

The lay-byes along Holme Lode will be improved to provide additional parking

Feature :19 safety checks

Target for safety of access structures and trees:

Maintain in safe condition

Objective Methods:

We will write and operate an interpretation plan for visitors. This will set out what we will interpret, and how. Our green travel plan will inform visitors how they may visit the NNR using public transport or their fuel-efficient cars.

Natural England has standards for visitor facilities for its nature reserves, which fall into various categories depending on suitability for access. Woodwalton Fen currently falls into the old English Nature 'silver' category. These standards are under review.

We will check all access structures, such as gates and stiles and steps once every three months, and take corrective action where necessary to maintain structures in a safe condition. We will check tree safety, with our own staff (non arboriculturalists) at least once a year in high risk areas where people are most likely to be found. These 'Zone 1' areas are shown on a map in the maps section. Safety checks will not be carried out in areas closed to the public, where no visitors are expected, if there is the possibility of illegally disturbing rare birds. The access structure and tree safety check sheets are in the appendices.

Likely Significant Effect:

The proposals are not necessary for nature conservation management of the European site but will have no significant effect on the internationally important nature conservation features of the site.

Monitoring Methods:

- The access furniture and safety fencing are monitored and reported formally every three months.
- Tree safety checks in Zone 1 (high risk) areas are carried out at least annually.

Objective 8:
<p><u>Estate Assets</u> To maintain the estate assets in good condition.</p>
Features addressed by this objective:
All
Attributes/targets:
<p><u>Livestock fencing, gates and stiles</u> Target condition : Stock fencing and access furniture will remain in serviceable condition</p> <p><u>Visitor infrastructure</u> : Maintain droves and hides in safe and attractive condition. Maintain some access for less-able visitors around the Holme Posts area.</p> <p><u>Fuel and waste storage</u>; legal compliance</p> <p><u>Water Control Structures</u></p> <p>These will be maintained in a safe condition and locked to prevent unauthorised use. The IDB should be informed prior to any operation of sluices where it may impact on the low-level system.</p>
Objective Methods:
<p>The livestock require resources in terms of daily checking, veterinary medicines and routine checkups. We intend to use grazier's stock wherever possible but may supplement this with NE livestock if necessary.</p> <p>The livestock fencing, this will be replaced as necessary, with the amount of replacement fencing varying on a year to year basis depending on the condition of the fencing. Fence repairs will be made where necessary so that the fence remains serviceable for as long as possible before replacement. Electric fencing will continue to be used.</p> <p>There are a number of gates which will be repaired or replaced as necessary to maintain them in a safe and serviceable condition.</p> <p>All sluices will be checked and maintained in order to continue effective water control.</p> <p>The hide structures will be checked on a regular basis to ensure that safe access is maintained.</p>
<p>Likely Significant Effect: The fence repair / replacement proposals are necessary for nature conservation management of the European site.</p> <p>The other proposals are not necessary for nature conservation management of the European site but will have no significant effect on the internationally important nature conservation features of the site.</p>
Monitoring Methods:

Objective 8:

- The access furniture and safety fencing are monitored and reported formally every three months.
- Fence condition is formally recorded every five years but checked frequently on an informal basis.

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**Holme Fen NNR
Management Plan
Part 3 2015-20**

3.1 Identification of projects

Note: Projects are listed in CSMi. This schedule is for tasks associated with those projects, for Management Objectives 1.3

HOLME FEN NNR

5- YEAR WORK PLAN 2015-20

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
1. Subject to natural change, to maintain and where possible enhance condition of the mixed deciduous woodland NVC communities: W16 Quercus spp. – Betula spp. – Deschampsia flexuosa woodland / W6 Alnus glutinosa – Urtica dioica woodland / W2 Salix cinerea- Betula pubescens-	RP00	Collect data, climatological, general	✓	✓	✓	✓	✓	
	RP10	Collect data, hydrological, general	✓	✓	✓	✓	✓	Continue with monthly dipwell readings + new loggers. Install more data loggers.
	RP40	Collect data, pedological, general	✓					Peat profile survey
	RB00	Collect data, biological, general	✓	✓	✓	✓	✓	
	RF00	Collect data, vegetation, general	✓	✓	✓	✓	✓	Monitor AS Cook's bramble transects for deer damage

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
Phragmites australis woodland								Ct Location of first plot Orientation of transect 1 TL 19758996 80° 2 TL 20229009 240° 13 TL 20298928 350° 40 TL 21388867 40° 45 TL 21798867 5° 47 TL 22118844 240°
	RA10	Collect data, birds, general	✓	✓	✓	✓	✓	Continue BBS counts Continue winter Webs counts on mere Monitor heronry (in 2014 it was in ct.2)s.
	RA40	Collect data, Lepidoptera, general	✓	✓	✓	✓	✓	Continue butterfly transect Continue moth trapping (B.Dickerson)

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
Subject to natural change, and where possible enhance wet woodland . NVC communities: W4 <i>Betula pubescens-Molinia caerulea</i> woodland W2(b) <i>Salix cinerea-Betula pubescens-Phragmites australis</i> woodland, <u><i>Sphagnum</i> ssp sub-community.</u>	RP10	Collect data, hydrological, general	✓	✓	✓	✓	✓	Continue with dipwells. Install more data loggers
	RP40	Collect data, pedological, general	✓	✓	✓	✓	✓	Peat profile survey
	RB00	Collect data, biological, general	✓	✓	✓	✓	✓	
	RF00	Collect data, vegetation, general	✓	✓	✓	✓	✓	
	RA10	Collect data, birds, general	✓	✓	✓	✓	✓	Continue BBS counts Continue winter Webs counts on meres
	RA40	Collect data, Lepidoptera, general	✓	✓	✓	✓	✓	
	RA80	Collect data, other/general invertebrates, general	✓	✓	✓	✓	✓	
	RA90	Collect data, fauna, general	✓	✓	✓	✓	✓	
	RH1+	Collect data, past management, general	✓	✓	✓	✓	✓	
	RH90	Collect data, other activities, by others	✓	✓	✓	✓	✓	
MH0+	Manage habitat,	✓	✓	✓	✓	✓		

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
		forest/woodland/scrub, general						
	MH5+	Manage habitat, swamp/fen/inundation, general	✓	✓	✓	✓	✓	
	MS00	Manage species, tree/shrub	✓	✓	✓	✓	✓	
	MS10	Manage species, other vascular plant	✓	✓	✓	✓	✓	
	ME++	Install Water control	✓					Rymes/ct.2; Short Drove dyke
	ME20	Comply with legal obligations	✓	✓	✓	✓	✓	
	MG++	Husband grazing animals, general	✓	✓	✓	✓	✓	
	RA80	Collect data, other/general invertebrates, general	✓	✓	✓	✓	✓	Investigate limiting factors for White Admiral population
	RA90	Collect data, fauna, general	✓	✓	✓	✓	✓	Monitor birds by BBS transects and Webs counts; Monitor heronry (in 2014 it was in ct.2)
	RH1+	Collect data, past management, general	✓				✓	

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
	RH90	Collect data, other activities, by others	✓	✓	✓	✓	✓	Camping, fires etc.
	MH0+	Manage habitat, forest/woodland/scrub, general	✓	✓	✓	✓	✓	Control sycamore and rhododendron; Ensure unsafe trees removed/limbed. Continue ride-edge/glade mowing
	MH5+	Manage habitat, swamp/fen/inundation, general	✓	✓	✓	✓	✓	Control water levels in ditches to raise WL within peat body
	MS00	Manage species, tree/shrub	✓	✓	✓	✓	✓	Clear fallen trees as necessary
	MS10	Manage species, other vascular plant	✓	✓	✓	✓	✓	
		Manage Species deer	✓	✓	✓	✓	✓	Continue muntjac stalking to maintain population at level which does not compromise herb layer within woodland
	ME20	Comply with legal obligations	✓	✓	✓	✓	✓	Ensure regular inspection of structures and trees to ensure safety

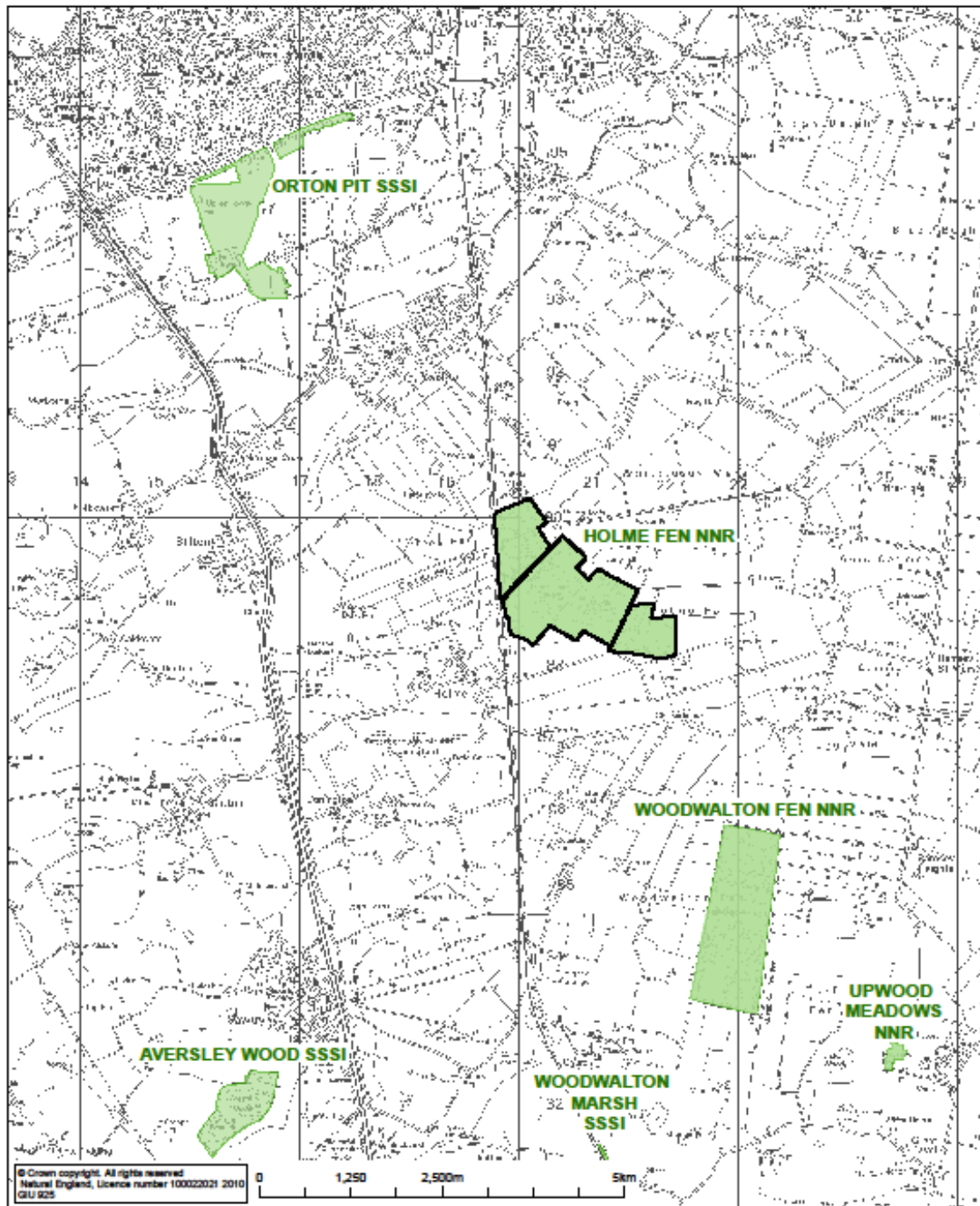
Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
	MG++	Husband grazing animals, general	✓	✓	✓	✓	✓	
	ME00	Manage site infrastructure, general		✓				Replace vehicle bridge over Caldecote dyke
	ME40	Provide/maintain paths/rides/roads	✓	✓	✓	✓	✓	Mow regularly and provide duckboards where necessary
	RP00	Collect data, climatological, general	✓	✓	✓	✓	✓	
	RP10	Collect data, hydrological, general	✓	✓	✓	✓	✓	Continue with dipwells. Analyse data from logger in ct. 18.
	RP40	Collect data, pedological, general	✓					Peat profile survey
	RB00	Collect data, biological, general	✓	✓	✓	✓	✓	
	RF00	Collect data, vegetation, general	✓			✓		Monitor present distribution/species of Sphagnum. CARE – do not trample!
	RF10	Collect data, trees/shrubs, general	✓	✓	✓	✓	✓	Continue Gill tree study in ct 18. Assess effects of water level changes on tree health/species.

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
	RF20	Collect data, other vascular plants, general	✓		✓		✓	Carry out botanical and bryophyte survey in ct. 18. Set up quadrats to monitor effects of rising water levels on vegetation.
	RA10	Collect data, birds, general	✓	✓	✓	✓	✓	Continue BBS counts
	RA40	Collect data, Lepidoptera, general	✓	✓	✓	✓	✓	Continue butterfly transect Continue moth trapping (B.Dickerson)
	RA70	Collect data, other/general insects, general	✓	✓	✓	✓	✓	
	RA80	Collect data, other/general invertebrates, general	✓		✓	✓	✓	Monitor <i>Orchestes</i>
	RA90	Collect data, fauna, general	✓	✓	✓	✓	✓	Deer monitoring
	RH1+	Collect data, past management, general	✓				✓	
	RH90	Collect data, other activities, by others	✓	✓	✓	✓	✓	

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
Objective 3: Subject to natural change, to maintain and where possible enhance wet heath M16 and lagg fen as a precursor to lowland raised bog (M18).	RP10	Collect data, hydrological, general	✓	✓	✓	✓	✓	Continue with dipwells. Install more data loggers
	RP40	Collect data, pedological, general	✓	✓	✓	✓	✓	Peat profile survey
	RB00	Collect data, biological, general	✓	✓	✓	✓	✓	
	RF00	Collect data, vegetation, general	✓	✓	✓	✓	✓	
	RF10	Collect data, trees/shrubs, general	✓	✓	✓	✓	✓	
	RF20	Collect data, other vascular plants, general	✓	✓	✓	✓	✓	
	RA10	Collect data, birds, general	✓	✓	✓	✓	✓	Continue BBS counts Continue winter Webs counts on meres
	RA40	Collect data, Lepidoptera, general	✓	✓	✓	✓	✓	
	RA80	Collect data, other/general invertebrates, general	✓	✓	✓	✓	✓	

Objective	Project Code	Project Title	Year					Notes
			1	2	3	4	5	
	RA90	Collect data, fauna, general	✓	✓	✓	✓	✓	
	MH0+	Manage habitat, forest/woodland/scrub, general	✓	✓	✓	✓	✓	
	MH5+	Manage habitat, swamp/fen/inundation, general	✓	✓	✓	✓	✓	
	MS00	Manage species, tree/shrub	✓	✓	✓	✓	✓	
	MS10	Manage species, other vascular plant	✓	✓	✓	✓	✓	
		Install Water control	✓					Rymes/ct.2; Short Drove dyke

**Holme Fen NNR
Management Plan
Appendices 2015-20**

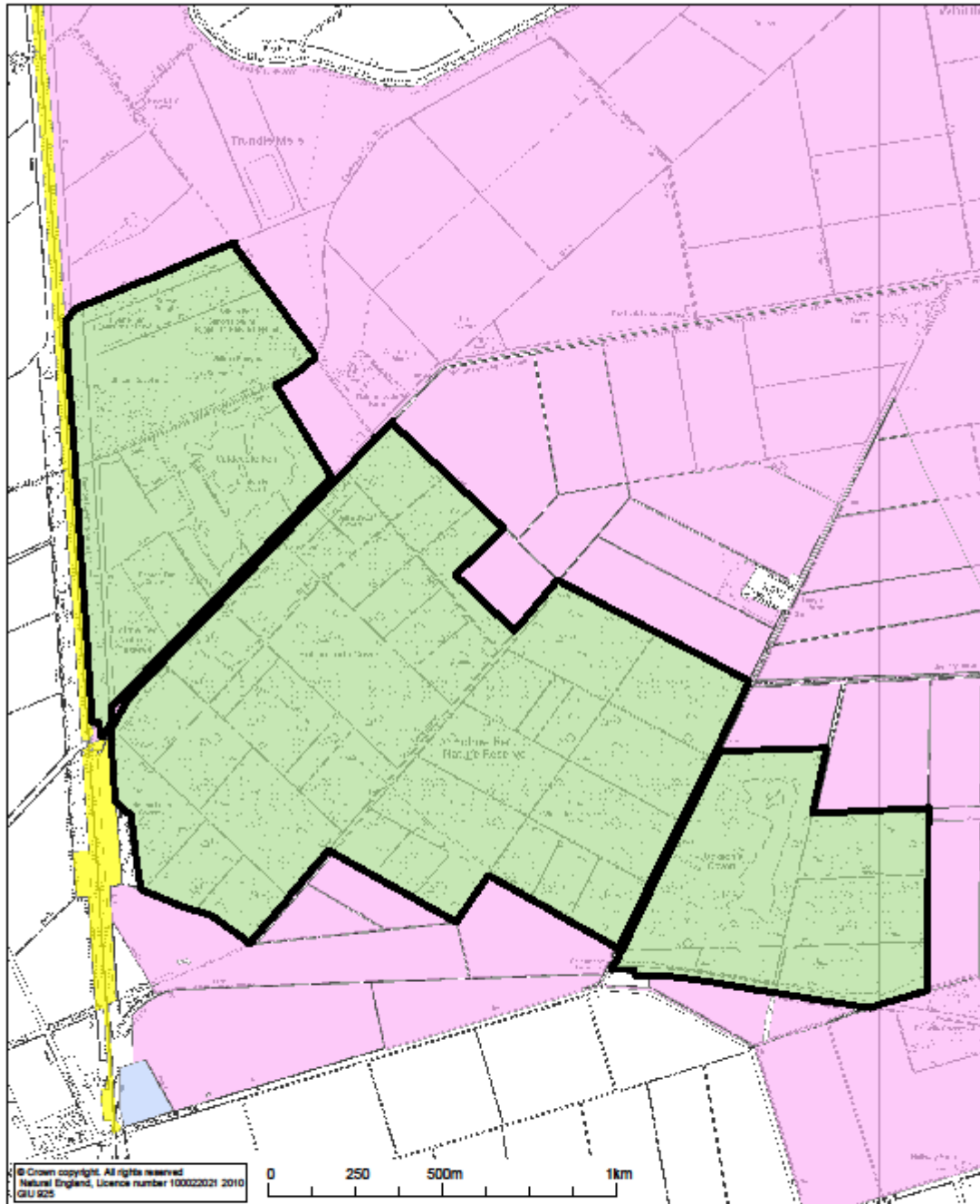


**Holme Fen NNR
Location**






OS Explorer
Map 142 - Peterborough



Map 1

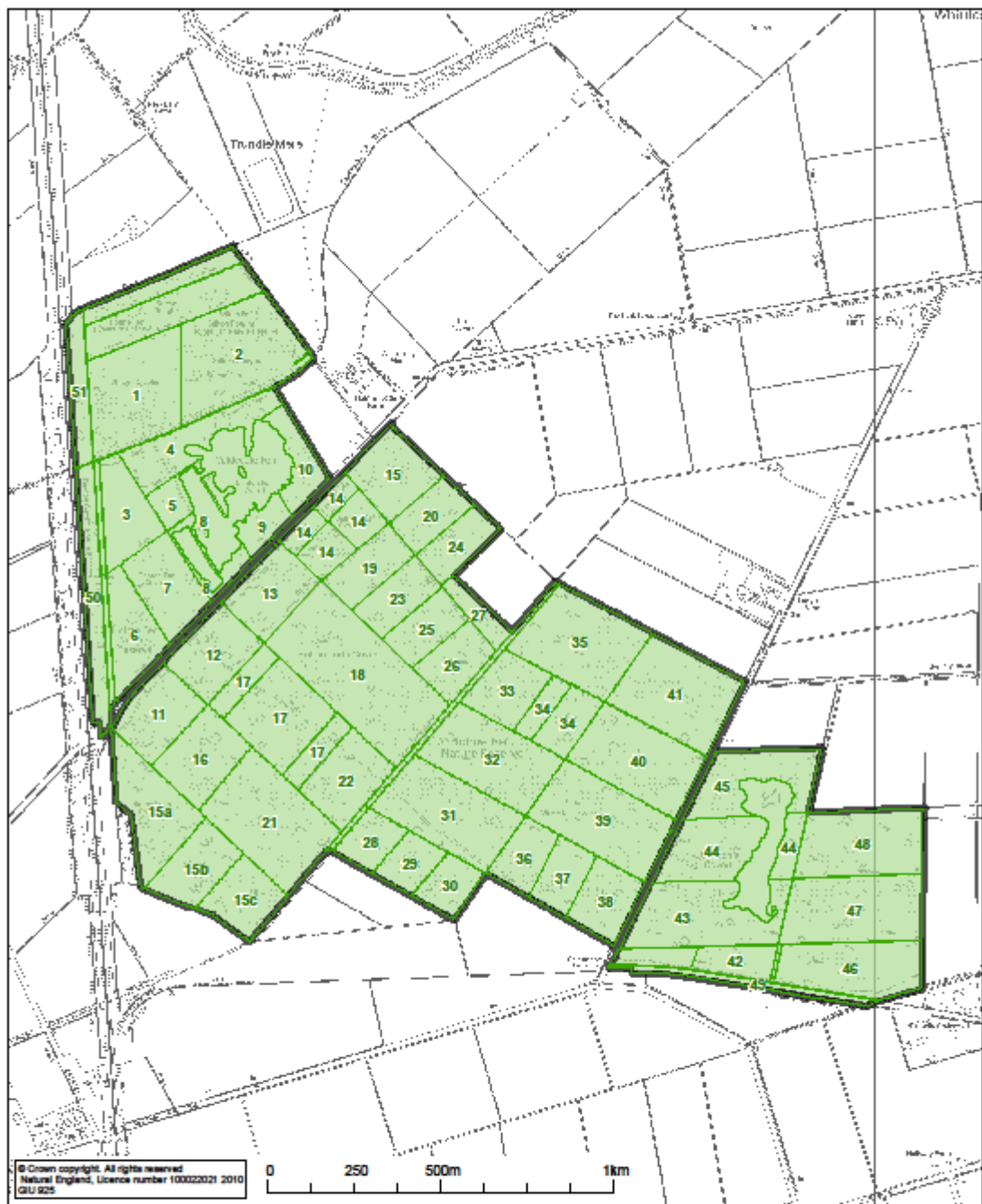


Holme Fen NNR Tenure

- | | |
|---|---|
|  Wildlife Trust BCNP (Great Fen Project) |  Unknown |
|  Natural England |  Holme Fen NNR |
|  Railtrack | |

NATURAL
ENGLAND

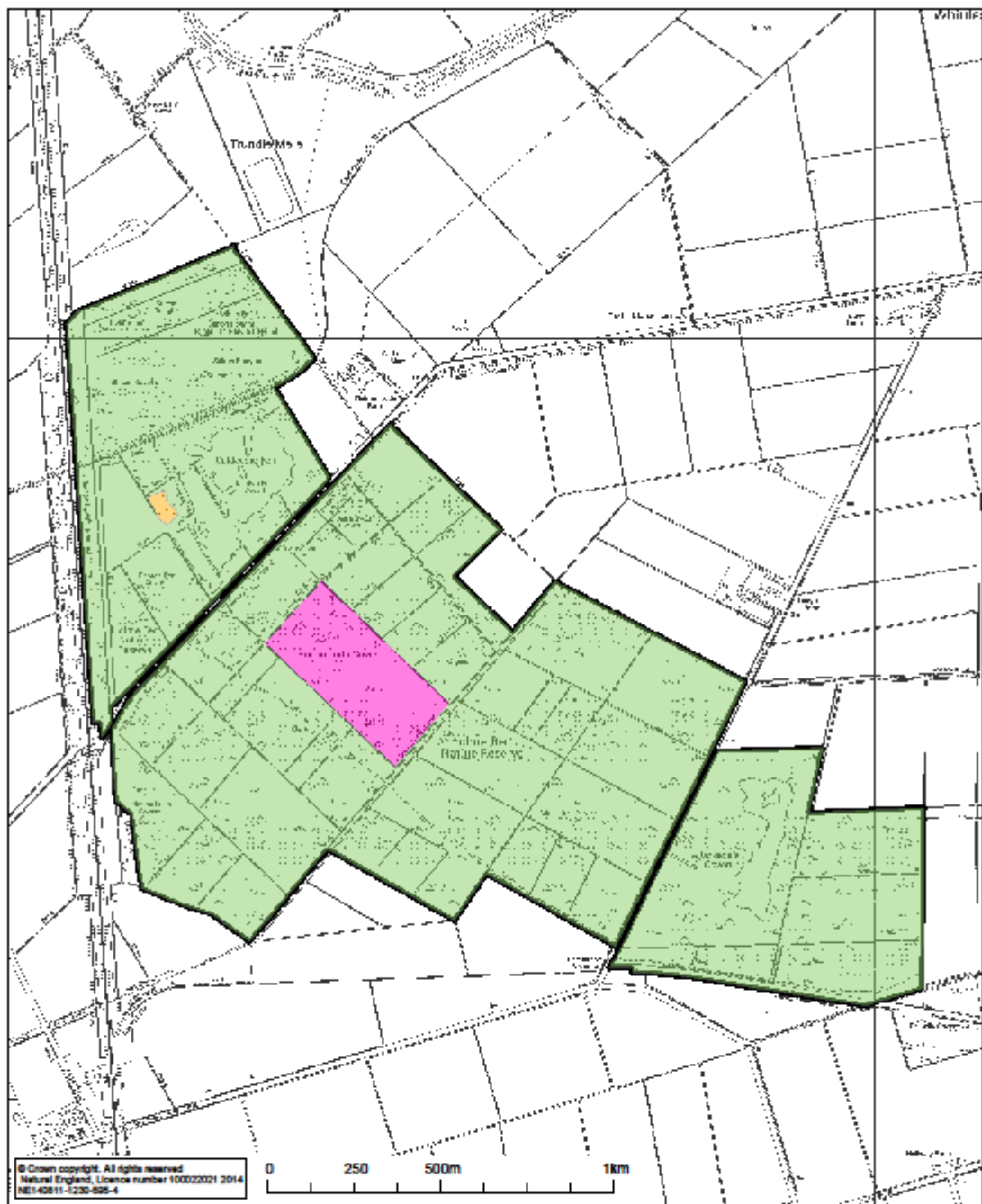
Map 2



Holme Fen NNR NNR Compartments



Map 3

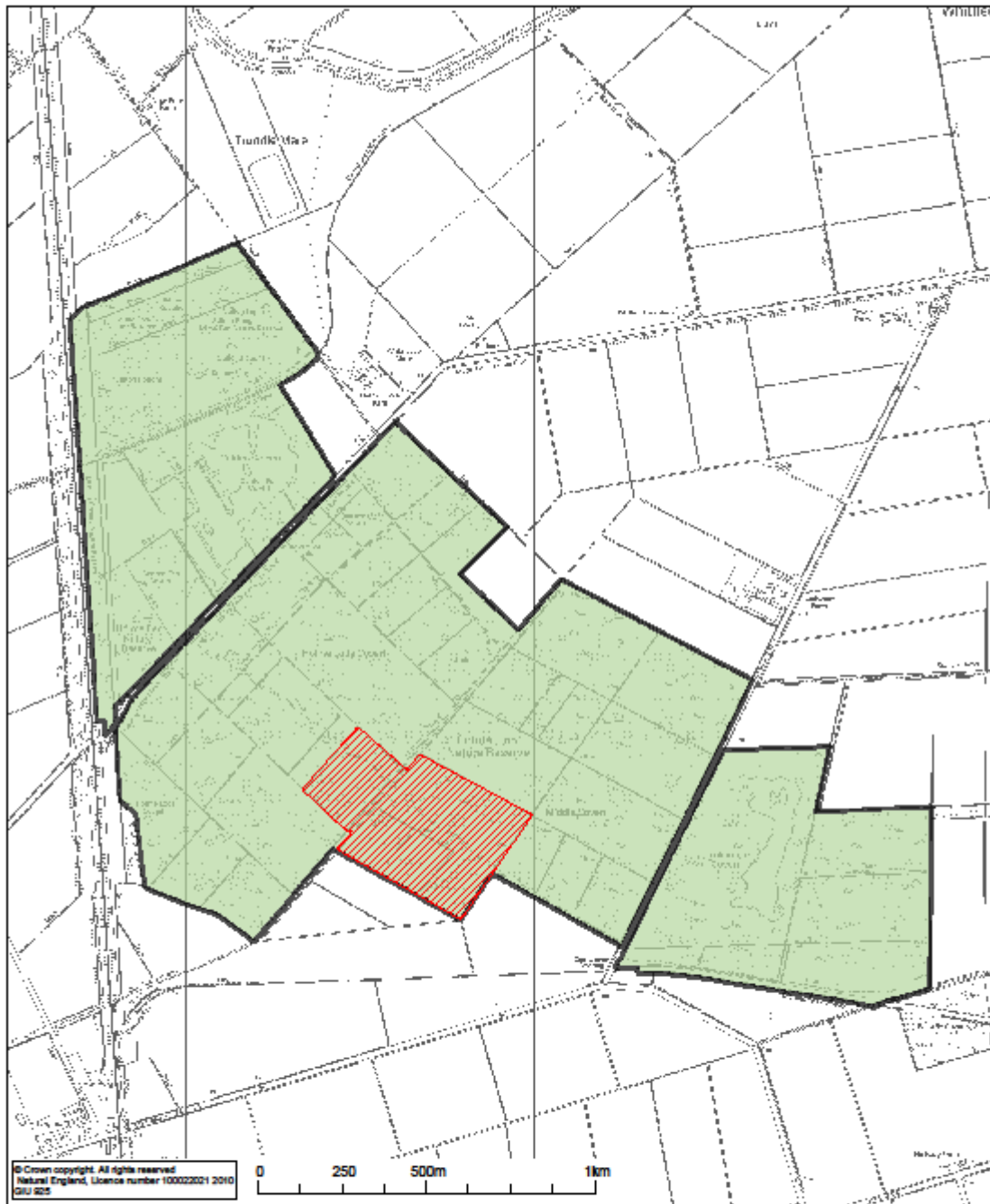


Holme Fen NNR Site Units



- Unit 1. Lowland birch and mixed woodland
- Unit 3. Raised bog
- Proposed extension to Unit 3



Map 4

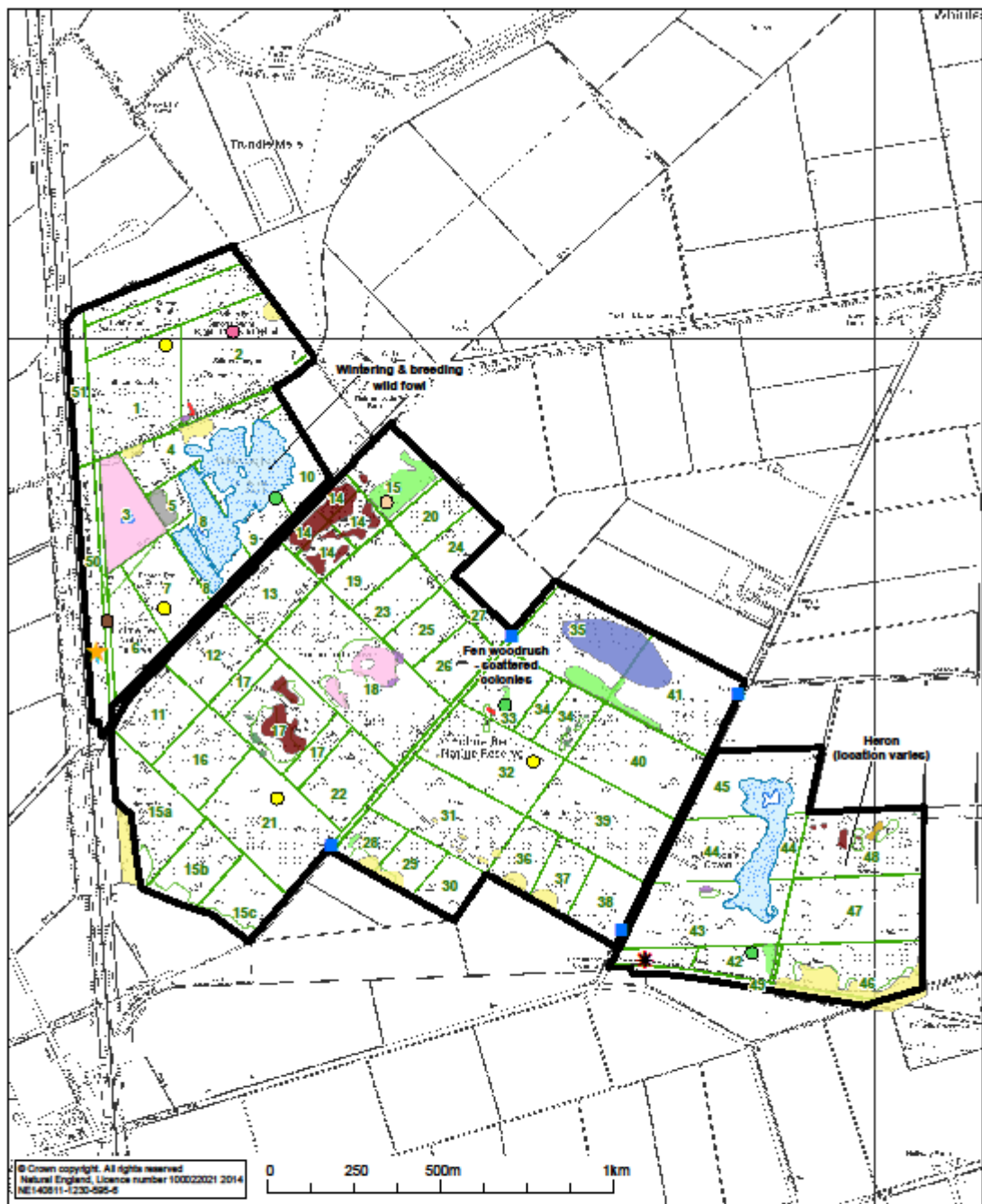


Holme Fen NNR Designations

-  Geological Conservation Review
SSSI Boundary
-  NNR / SSSI



Map 5



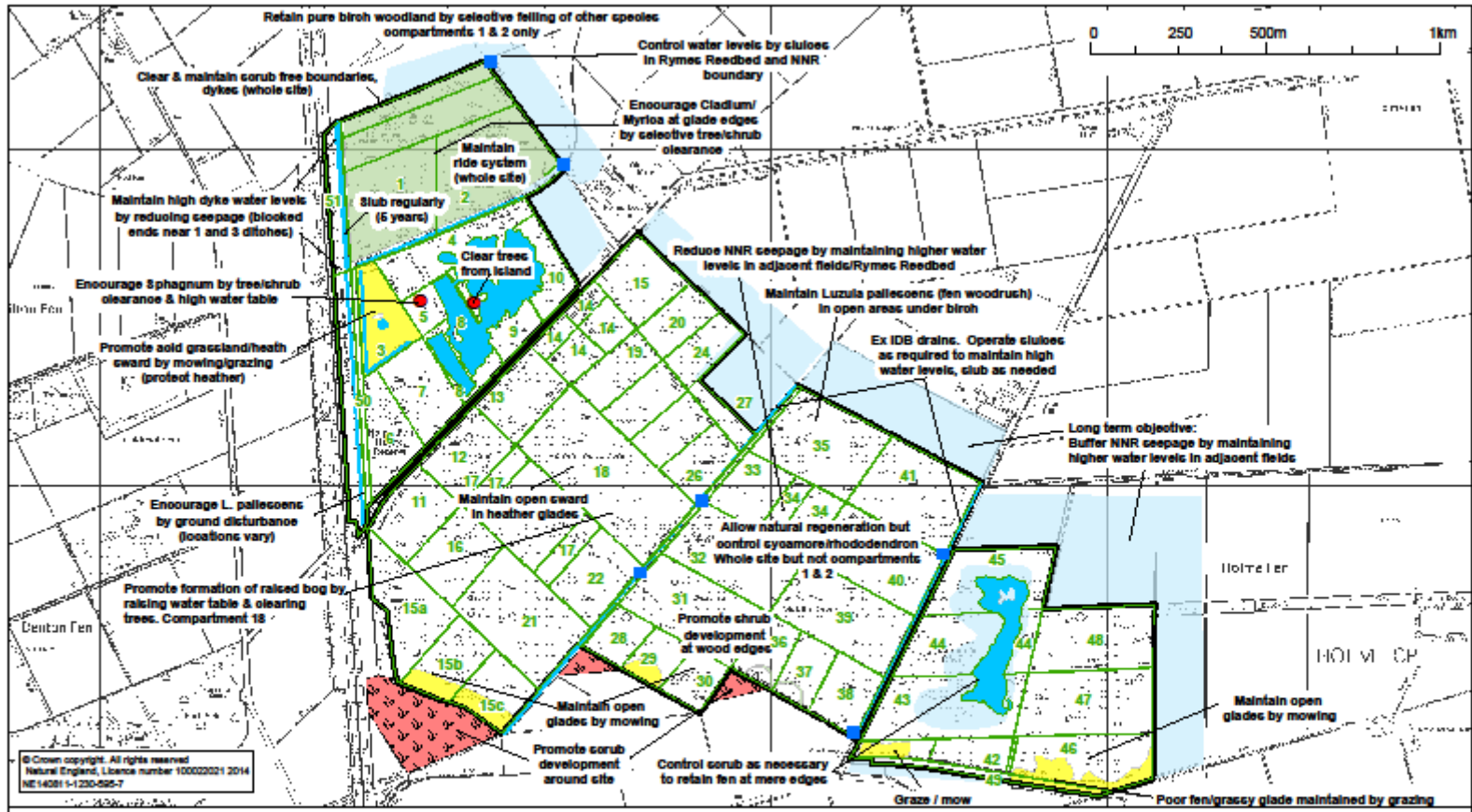
Holme Fen NNR

Vegetation Map and Other Biological Features

- | | | | | |
|--|--|---|--|------|
| <ul style="list-style-type: none"> ● Climbing <i>Corydalis</i> widespread ● Very local Fen Woodrush ● Meadow Rue ● Royal Fern ● Scattered Saw Sedge | <ul style="list-style-type: none"> ■ Sluice ★ <i>Twayblades, viola carinata/montana</i> ○ Weevil (<i>orchestes</i>) ■ Acid grassland /Heath ■ Alder | <ul style="list-style-type: none"> ■ Bog Myrtle ■ Elder ■ Fen woodrush ■ Grassy glade ■ Plantation | <ul style="list-style-type: none"> ■ Oak ■ Pond ■ Saw sedge ■ Mixed woodland ■ Sphagnum sub community | Mere |
|--|--|---|--|------|

NATURAL ENGLAND

Map 6

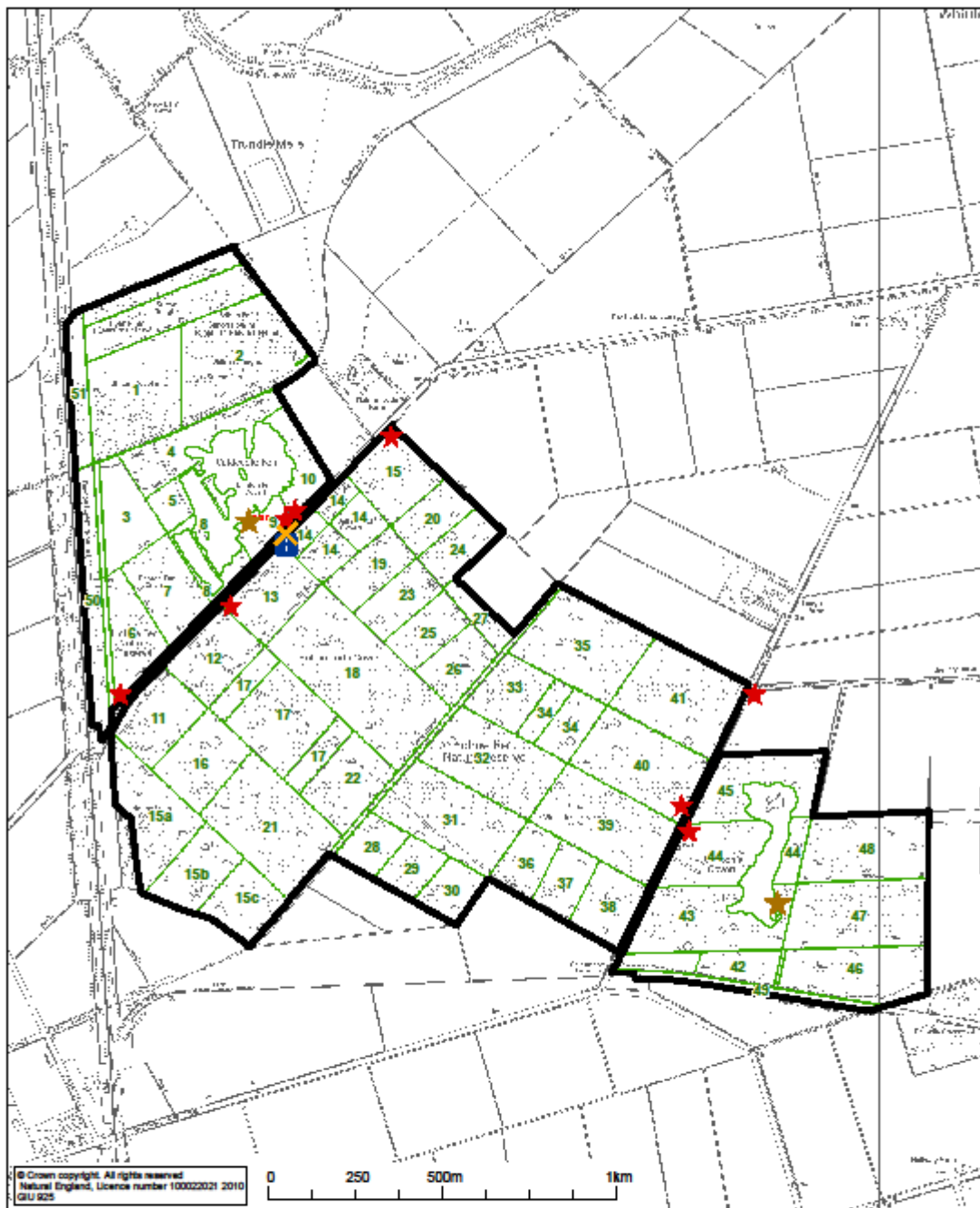


**Holme Fen NNR
Planned Management
Geological & Biological Objectives**



- Possible Grazing
- Habitat & Species Management
- Hydrological
- NNR / SSSI
- Scrub development
- Dykes
- New sluice
- Habitat & Species Management

Map 7

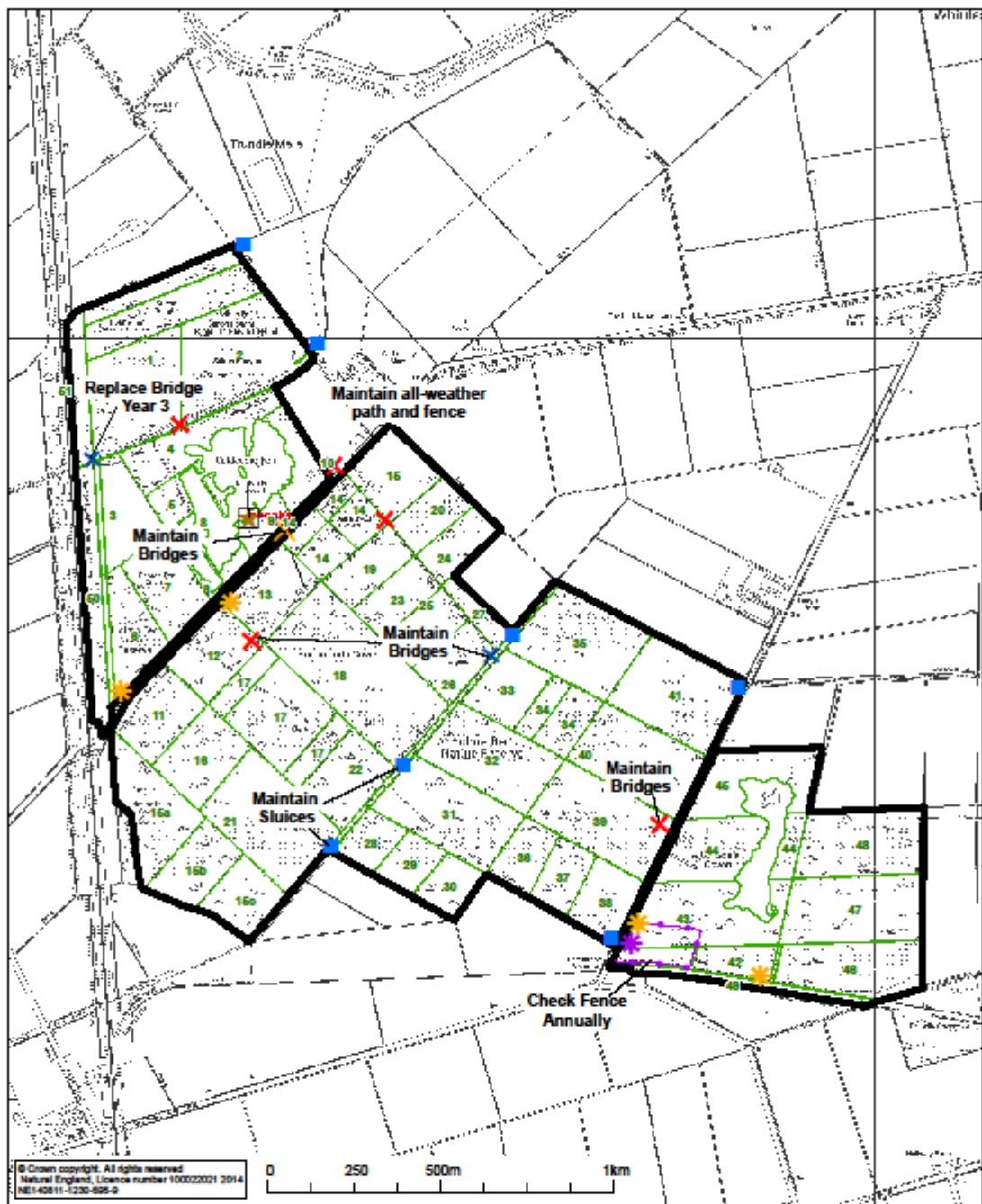


**Holme Fen NNR
Planned Management
Access & Visitor Features**



-  Disabled Bridge & Ramp
-  Hide
-  Interpretation Board
-  NNR Sign
-  Easy Access Path
-  Holme Fen NNR

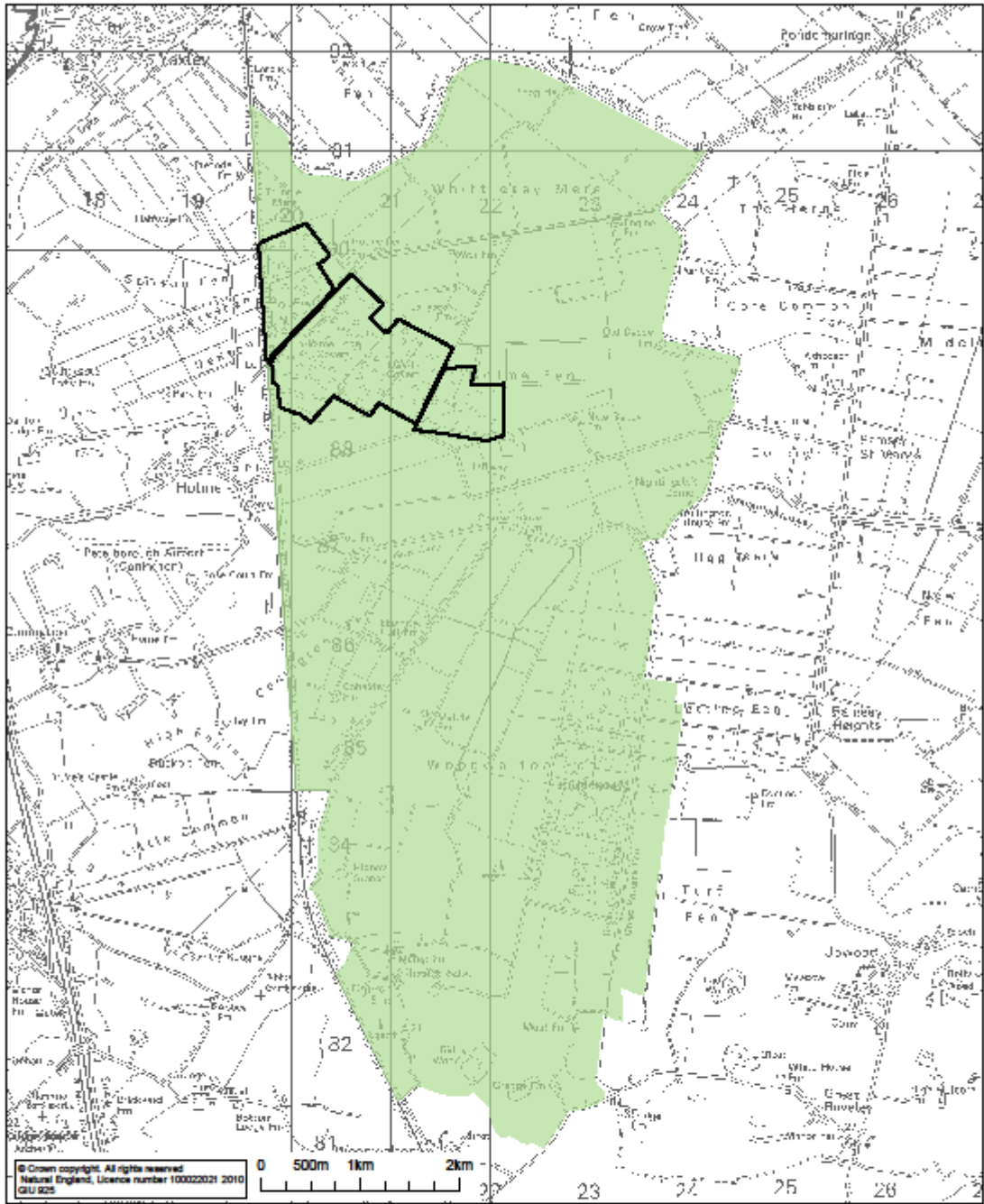
Map 8



Holme Fen NNR
Planned Management of Estate Assets

<ul style="list-style-type: none"> * Cattle pen * Disabled Foot Bridge with Roadside Ramp * Field Gate X Foot Bridge 	<ul style="list-style-type: none"> X Vehicle Bridge Hide/Screen ■ Water Control Point All Weather Path 	<ul style="list-style-type: none"> — Post & Wire Fence Holme Fen NNR
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Map 9

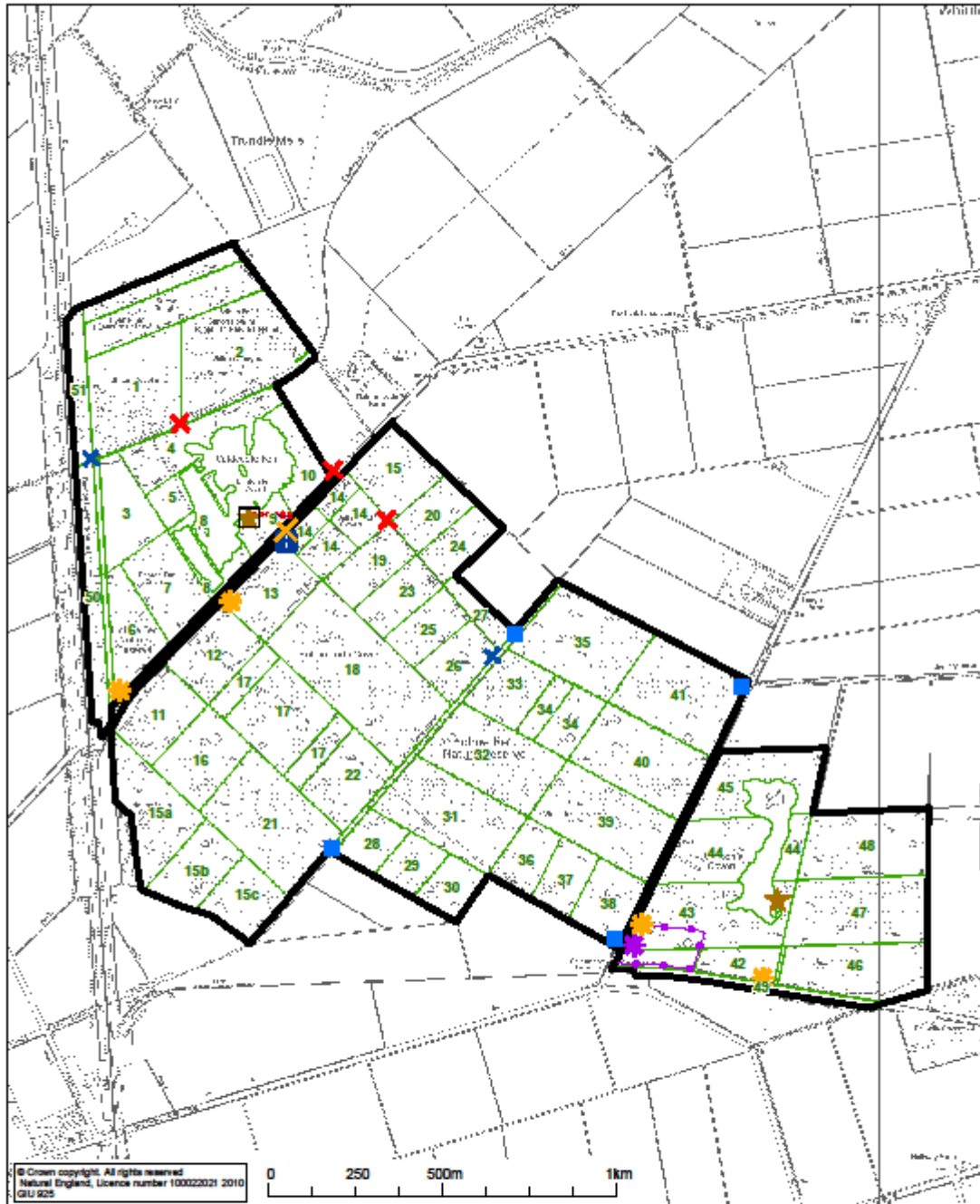


Holme Fen NNR
Planned Management
Cultural & Landscape Objectives



- Great Fen Project
- Holme Fen NNR

Map 10



Holme Fen NNR Estate Assets



- | | | |
|---|---------------------|---------------------|
| Cattle Gate | Hide | Water Control Point |
| Disabled Foot Bridge with Roadside Ramp | Hide/Screen | All Weather Path |
| Field Gate | Interegration Board | Post & Wire Fence |
| Foot Bridge | Vehicle Bridge | Holme Fen NNR |

Map 11

Climate Change Vulnerability Assessment

Feature no.	Feature name	Rainfall	Temperature	Externe Events	In Combination	Reasoning	Confidence	Responses
1	Population of RDB plant - <i>Luzula pallidula</i> , Fen Wood-rush	H	M	M	H	Lower summer rainfall, especially in combination with higher summer temperatures causing more evapotranspiration, may lead to the habitat becoming unsuitable for this species. Drought events may cause plant stress or mortality.	M	It is expected that some level of control of water level management of the site through the ditch network will become increasingly possible in the future if deemed necessary. Raising ground water in compt. 18 with a view to eventually restoring raised bog should provide additional suitable habitat, and plant translocations should be considered if it appears that the habitat where it occurs is becoming unsuitable.
2	Woodland: W16 - <i>Quercus</i> spp.- <i>Betula</i> spp.- <i>Deschampsia flexuosa</i> woodland W2 - <i>Salix cinerea</i> - <i>Betula pubescens</i> - <i>Phragmites australis</i> woodland W4 - <i>Betula pubescens</i> - <i>Molinia caerulea</i> woodland W6 - <i>Alnus glutinosa</i> - <i>Urtica dioica</i> woodland	L	M	M	M	Warmer winters are likely to benefit deer (and squirrels, but tree communities at this site are not particularly vulnerable to squirrel damage), potentially causing reduced ground flora cover or reduced natural regeneration. Increased risk of wind throw and of stress/mortality due to drought or flooding events. Higher winter water table may cause water logging of the soil and lead to increased dominance of alder or willow and changes in the ground flora. Stressed trees are more susceptible to pests and diseases, and warmer winters may benefit pests and diseases (e.g. <i>Phytophthora</i> , which may infect <i>Alnus glutinosa</i>	M	Deer are currently shot at both Holme Fen and Woodwalton Fen. The deer management effort may have to be increased. Fewer trees may be beneficial to the restoration of fen and eventually raised bog, and a more diverse suite of woodland trees would be a favourable result of climate change. The Great Fen Project will lead to other opportunities for the development of woodland, and flexibility over the locations of habitats may be necessary to ensure that all opportunities may be taken to enhance and extend protected habitats. It is expected that some level of control of water level management through the ditch system will allow tree cover to be maintained in as much of the site as deemed appropriate.
3	Lowland raised bog	H	M	M	H	Higher summer temperatures will increase the effect of lower summer rainfall and cause the habitat to be too dry for active lowland raised bog. Lower summer rainfall is the biggest constraint to achieving active lowland raised bog	M	If sufficiently extreme, this will prevent the restoration of lowland raised bog on the site and no response will counteract it.
82	Community Involvement	L	L	L	L	Holme Fen is large minimum-intervention with little organised community involvement	H	
83	Education	L	L	L	L	Although site access may be difficult during flooding events or during the winter, this is unlikely to have much effect	H	
84	Research	L	L	L	L		H	
85	Demonstration	L	L	L	L		H	
86	Public Access	M	L	M	L	Some parts of the reserve that are currently used by the public may be flooded more often in the winter or during extreme flood events, and a greater likelihood of windblow may impede footpaths.	M	The visitor route may need to be changed or further measures to provide all-weather access provided to avoid wetter areas during the winter.
87	Estate Assets	L	L	L	L		H	

